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July 2014
Issue 404

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+ OPTICAL vs LASER MICE & MECHANICAL KEYBOARDS COMPARED

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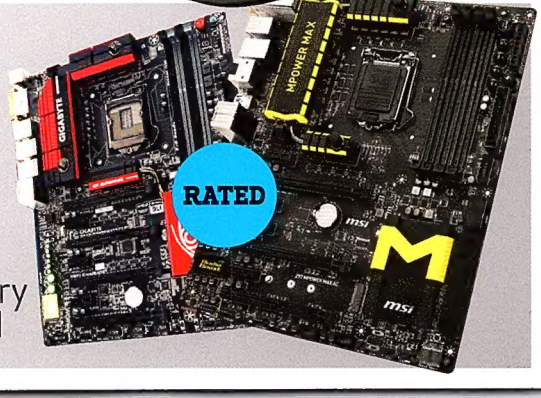

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FIPP

Can Apple catch Android?

APC's editor reckons healthy competition in the smartphone market is critical to avoiding another Windows situation.

No matter where you stand on the mobile device spectrum (be that Android, iOS, Windows Phone or BlackBerry), it's hard to deny that Apple – once the undisputed forerunner in the smartphone world – has lagged behind Android for a generation or two of phones. It did a partial pivot last year with iOS 7, but that wasn't seemingly enough to reverse the movement to Android.

This year, Apple's strategy largely seems to be 'if you can't beat 'em, join 'em', with rumours of perhaps two new larger-screened iPhones arriving (at 4.7-inches and 5.5-inches) and the newly-unveiled iOS 8 taking a few clear queues from the Android playbook. And that's a good thing: Apple's borrowing from the best in both cases – with every major Android phone maker releasing 5-inch or bigger flagships this year, the market has clearly spoken – and it's stated quite clearly that it likes big phones. It's a reversal of Apple's previous (though loose) design philosophy that a smartphone needs to be comfortable – and usable – with just one hand, as are iOS 8 features like being able to change the keyboard. The latter's a feature that's clearly distinguished Android from iOS, where fast, flexible, swipe-driven keyboards are now the norm. Other killer features pinched from Android are live home-screen widgets and more interactive notifications.

This is all great news for Apple owners – and might even be enough to sway a few users to switch back – but what's a little perplexing is how long it's taken the company this long to implement them.

Competition has, it's clear, forced Apple's designers to make some concessions and disembark from the Steve Jobs philosophy. But the market domination of Android phones clearly demonstrates that Jobs didn't always have it right – or rather, that following a philosophy doggedly is not always the way to stay ahead. If the last five or six years of tech upheaval have demonstrated anything, it's that you need to adapt the recipe to suit your customer's changing tastes. Even Apple haters will probably admit (begrudgingly or not) that having a second big player in the smartphone and tablet sphere is good for competition and ultimately good for the consumers – I don't think any of us want to see a single company come to dominate the tech market the way that Microsoft has done with Windows, which has stagnated for years and made a disastrous turn with Windows 8.

So can Apple still catch up with Android? I'm no Apple fanboy, but I bloody well hope so.

DAN GARDINER
EDITOR
dan.gardiner@futurenet.com

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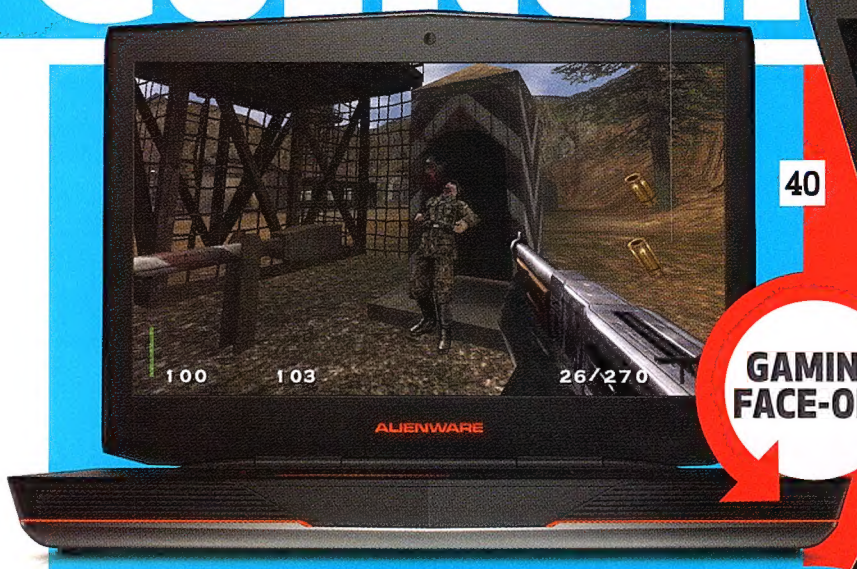

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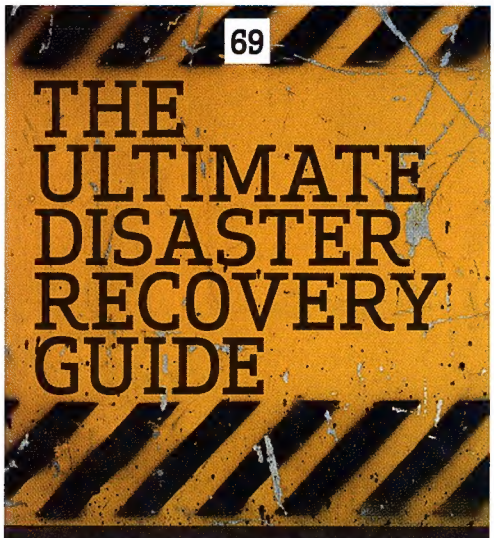

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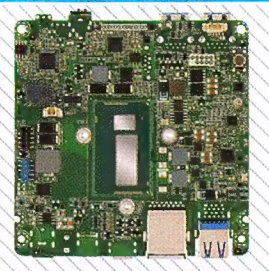

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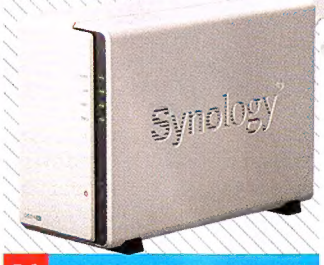

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The Windows XP tweak Microsoft doesn't want you to know about...

Fooling your PC into thinking it's a different version of Windows could renew XP's cut-off support, but is it worth the risk? Unlikely, says Peter Dockrill.

Windows XP is over. It's dead. Gone. Kaput. Microsoft has retired the OS and ceased providing updates for it, advising users to move onto newer, more secure and still supported Windows versions (chiefly Windows 8/8.1). You're probably well aware of this, as we've discussed the issue a few times in APC. And yet, a huge number of users are still running the outdated operating system, with worldwide web usage stats provided by Net Applications revealing a stunning 25.3% of desktop web traffic still stems from Windows XP, which has only suffered a tiny 2.4% dip since March, when Microsoft commenced a publicity barrage – including nagging on-screen pop-ups – urging users to upgrade for security reasons. The world's reaction to this? A collective shrug!

And now the challenge for Microsoft may be compounded by the discovery that a relatively simple registry hack can trick your Windows XP system into identifying itself as another Windows OS, renewing software and security updates and in effect future-proofing the ancient OS for another five years. According to Beta News (**tinyurl.com/qxx7ehz**), tweaking your registry with the addition of a single text file containing three lines of code enables XP users to access updates intended for the XP-based variant of Windows Embedded Industry, which is set to receive support until April 2019. Still, there's no official word on how effective the Win Embedded updates are for XP systems, or how nicely they'll play with your setup, nor how long the hack will prove effective for (if Microsoft finds a way to disable it).

As the company has warned in its response to the news of the hack breaking: "We recently became aware of a hack that purportedly aims to provide security updates to Windows XP customers. The security updates that could be installed are intended for Windows Embedded and Windows Server 2003 customers and do not fully protect Windows XP customers. Windows XP customers also run a significant risk of functionality issues with their machines if they install these updates, as they are not tested against Windows XP. The best way for Windows XP customers to protect their systems is to upgrade to a more modern operating system, like Windows 7 or Windows 8.1."

Are you still using Windows XP? If so, what are your reasons for sticking with it, and how are you safeguarding your system?

Drop us a line at *apcmag@futurenet.com*.

Greener pastures? Tricking your PC into thinking it's a cash register might just safeguard your XP setup for another five years. Or not...

Samsung Z: the world's first Tizen smartphone

It's not everyday that the world's largest smartphone vendor debuts a new smartphone OS, but that's just happened with Samsung unveiling the Samsung Z, the world's first Tizen model smartphone, and the clearest indication yet of the Korean company's determination to stand independently from Google and Android in the mobile sphere. The LTE quad-core model features a 4.8-inch 1,280 x 720 display, 2GB RAM and 16GB onboard storage, and is set to launch in various international markets after its initial rollout in Russia in Q3. But as for apps? Um. Guess, we'll have to check in on Tizen later.

Time to sell your cable ties?

Any APC reader is likely to be familiar with 'cable hell': the interlocking knots of cables and cords that lurk entwined behind many a PC (and don't get us started on that dusty spare cords box in the garage – we don't even want to think about it). Enthusiasts, tidy freaks and the kinds of people who have a loyalty card at Howard's Storage World know well that a few smartly placed cable ties can clean up cable hell for good – but if Intel has its way we won't even need to go that far. At Computex in Taiwan, the chip giant has outlined plans for incorporating the wireless WiGig standard in its upcoming CPU reference design, 'Skylake', with pundits claiming the technology could make the PC cable-free as soon as 2016. The protocol may not offer good range (only about 10m) but it does pack decent speed: up to 7Gbps, which should make it ideal for 'docking' PCs wirelessly with displays, keyboards, mice and other peripheral devices.

Second time lucky? A decade on from the Swatch 'Paparazzi', Microsoft is re-dabbling in smartwatches.

Rumour mill: the Microsoft smartwatch

Sales data shows smartwatches aren't a hit with consumers yet, but there's no shortage of vendor jostling as companies seek to carve out control of the nascent category. In addition to efforts by Samsung, LG, Pebble, Sony and the Android Wear brigade, reports indicate Microsoft is also devising its own smartwatch product. Little is yet known about the device, other than that – like Apple's long-rumoured iWatch – it's said to have a focus on health and fitness tracking and will sync with iPhones and Android smartphones in addition to Windows Phone. It's been suggested the MS watch may even see the light of day as soon as this year, but we'd advise filing this one under 'TBC' for now.

Feature roundup: OS X 'Yosemite'

At its recent Worldwide Developers Conference, Apple previewed the successor to Mavericks, OS X Yosemite, due out later in the year. In short, the release continues the trend towards a more iOS-like experience on the Mac desktop, both visually and functionally, along with ever tighter integration with Apple's mobile ecosystem. Here's what Mac users can expect to see come the official release in spring, but you don't have to wait — if you sign up for Apple's Beta Program (**appleseed.apple.com/sp/betaprogram/**) you can test-drive Yosemite today:

NEW LOOK
Significantly tweaked interface, with redesigned icons, translucency, iOS's bright colour palette (hmm...), less skeuomorphism, even a new system font.

ICLOUD DRIVE
Apple extends iCloud further to a more versatile Dropbox competitor; retains apps focus but adds more conventional file/folder features too.

NOTIFICATION CENTER
Revamped notifications panel includes more context with the new Today view, plus incorporates support for widgets.

SPOTLIGHT
The Mac's built-in desktop search revitalised with a new interface, greater reach, and even embraces Bing now for web search in a rejection of Google.

COMMUNICATIONS
iPhone users can make and receive calls and SMS text messages on their Mac, in addition to existing iMessage functions.

HANDOFF
New data 'continuity' features bridge the productivity gap between iOS and Mac (eg. start writing an email on one device, finish it on another).

INSTANT HOTSPOT
No Wi-Fi, no worries. New networking features enable Macs, iOS devices and Apple TVs to share data without a background Wi-Fi network (in some cases).

185TB

Sony's new magnetic tape technology stores 185TB of data on a single cartridge

For most consumers, tape technology is a dust-gathering relic from decades past, but in the enterprise IT world magnetic tape is still a commonly used method of storing and archiving large amounts of data. Sony and IBM have now developed the world's highest areal recording density magnetic tape, capable of recording 148 gigabits per square inch, enabling 185TB to be stored on a single cassette tape, 74 times the capacity of current-gen tape tech.

1,704 x 960

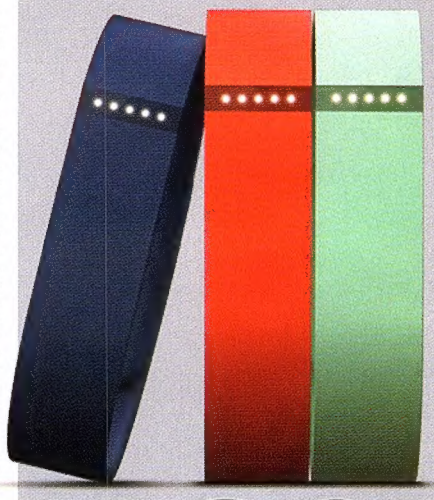
Expected display resolution of iPhone 6, according to 'sources'

Apple product launches used to be something to really look forward to, back when Steve Jobs could stun the world by pulling the latest digital rabbit out of his hat. These days, the continual and intense degree of scrutiny collectively fixated on the company by media, bloggers, leakers and analysts ensures Apple has almost no surprises left to reveal come launch day. According to inside leaks, the smart money on this year's iPhone 6 is it will have a display resolution of 1,704 x 960 pixels, likely to be housed by 4.7- or 5.5-inch display form factors (or possibly both).

-100%

Reports claim the NSA records virtually all telephone calls made in the Bahamas and Afghanistan

Recent reports published by *The Washington Post* and *The Intercept* have claimed that the NSA records and stores nearly every local and international phone call made in the Bahamas, and Wikipedia's Julian Assange now asserts that a second (previously censored) nation has been subject to the same monitoring: Afghanistan. According to leaked NSA documents, the capabilities of the active call-monitoring system are mind-boggling, processing "over 100 million call events per day."



50%

Fitbit dominates worldwide wearables, accounting for nearly half of devices shipped

The wearables market is definitely growing, but it's still early days for this broad tech category, which ostensibly includes everything from activity trackers to smartwatches and optical gadgets. With most optical gear still in development, market watcher Canalys divides its assessment of the category into the two types of wearable bands: basic (relatively simple health trackers) and smart (more complex smartwatches). While Fitbit leads overall, accounting for nearly half of the 2.7 million devices shipped worldwide in Q1 2014, the 'smart' group is led by Pebble, Sony and Samsung.

US $324.5m

Ginormous salary-fixing scandal involving Apple, Google and more heads to settlement

A hush-hush agreement by Silicon Valley giants Apple, Google, Intel and Adobe to not poach each others' employees resulted in a massive antitrust lawsuit in the US, with more than 64,000 workers seeking US$3 billion in damages from the companies involved. Lawyers for Apple, Google, Intel and Adobe have negotiated to settle with the complainants for a fraction of the potential damages payout, however, with US$324.5 million nominated to be awarded to the plaintiffs. The wage conspiracy is said to have been in place between 2005 and 2009.

Have a need for speed?

Looking for a wireless router that delivers super-fast speed?

How does wireless speeds as fast as 1.3 gigabits per second sound? Well, hold onto your seats because Billion's new BiPAC 8800AXL wireless AC broadband router offers just that! Based on a Broadcom chipset, the BiPAC 8800AXL supports ADSL2+ and is fibre-ready, using an Ethernet Wide Area Network port to hook into the NBN as soon as it comes to your house. It also has four additional Gigabit Ethernet ports plus two USB 2.0 ports, allowing for 3G/4G modem connectivity, print serving or Network-Attached Storage.

Aside from being blazingly fast and NBN-ready, this amazing device is jam-packed with loads of other features, including:

- 4-port gigabit switch
- 1-port gigabit Ethernet WAN (EWAN)
- 2 USB ports for print server, NAS, DLNA and 3G/4G LTE USB modem
- ultimate wireless speed 300+1300Mbps
- SNR adjustments to achieve highest sync speeds
- monitoring of individual LAN/WAN traffic
- QoS for traffic prioritisation and bandwidth management

Speeds up to 1.3 gigabits per second

3 x faster than the current Wireless N protocol

BILCOMS-14

For further information on the Billion BiPAC 8800AXL or for a full list of Billion stockists Australia-wide, visit billion.com.au.

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BILLION

technotes

» GADGETS

GOOGLE CHROMECAST

$49 | PLAY.GOOGLE.COM

We're not altogether sure why it took so long to arrive on our shores, but Google's diminutive media dongle, Chromecast, is finally available in Australia. A surprise hit in the US – perhaps largely due to its extremely low cost – the Chromecast is an HDMI dongle that plugs into virtually any HDTV to let you 'cast' movies, music and web content (like YouTube) from Chrome-supported devices on your Wi-Fi network. It's not as flexible as some more full-featured media-playing devices on the market, but it's probably the only one you can carry in your pocket.

LOMO'INSTANT CAMERA

US$69 (KICKSTARTER) | WWW.LOMOGRAPHY.COM

Everything is cyclical. Now that we're all packing sophisticated, high-megapixel smartphone cameras, retro Polaroid-style instant cameras are coming back into vogue. But what about all those cool effects the Instagram generation has come to depend upon? The Lomo'Instant Camera by analogue photography gurus Lomography means you don't have to forgo your favourite creative gimmicks. Multiple lens attachments, long exposures, multiple exposures, variable aperture settings and even Instagram-style filters (via colour gels) mean your happy snaps will look like they time-travelled here from 1969. *Instantly*. But get in quick – the Kickstarter pledge spots are running out fast.

ASUS TRANSFORMER BOOK FLIP

$TBA | WWW.ASUS.COM/AU

We've seen a sprinkling of these transforming laptops that fold the screen around behind the main body to double as a tablet (most recently with HP's sub-$500 Pavilin x360) hit the Australian market over the last year or so – however none have really managed to capture our eye like ASUS's latest stab at the category. Perhaps it's the MacBook Pro-like industrial design and aluminium chassis or the incorporation of a half-decent Nvidia GeForce GT 840M graphics chip. Whatever the case, we're harassing ASUS so we can get our hands on one – it comes in 13.3-, 14- and 15.6-inch sizes – so keep your eyes open for a review in an upcoming issue.

RAZER JUNGLECAT

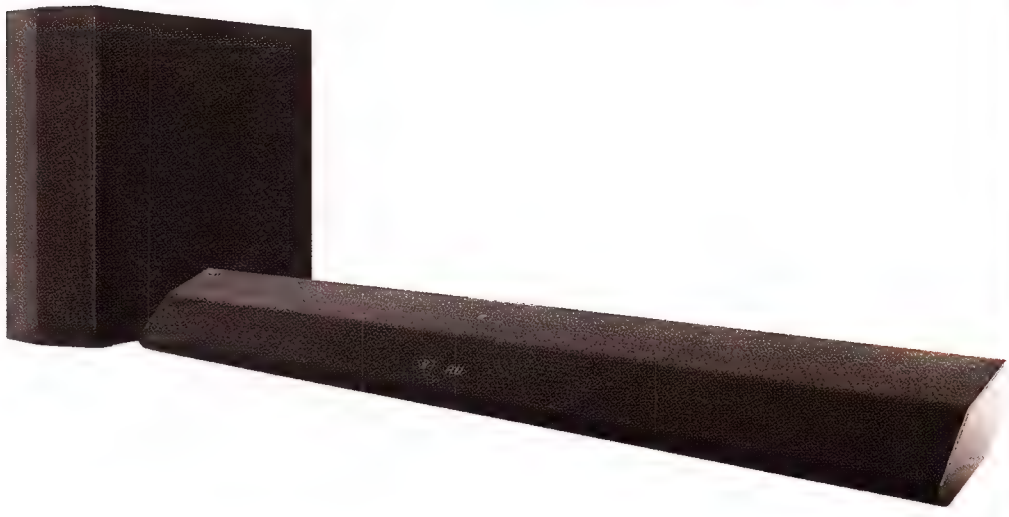
$140 | WWW.RAZERZONE.COM

So far, we've been rather unimpressed by the array of MFi gamepads that have come out since Apple set the controller standard in iOS 7. Using a pad to play games on your iPhone is definitely an idea we can get behind, but most of the offerings (which have even come from brands as big as Logitech) have been flimsy or too impractical. Razer's Junglecat looks to be a slightly more realistic unit. It doubles as a case that you can keep permanently attached to an iPhone 5/5s, with the controls sliding in or out from underneath as needed. Will this be the MFi controller to turn things around? Eh, probably not... but we can hope, can't we? The Junglecat is expected to ship mid-to-late July.

SONY HT-CT370

$449 | WWW.SONY.COM.AU

Flatscreen TVs sure have enlarged the viewing experience in our lounge rooms, but one area they're still arguably lacking in is audio quality and volume. A home theatre system is the best way to overcome that, but not everyone has the space (or inclination) to install a full 7.1-surround set up. Thus, TV speaker bars have been increasing in number over the last couple of years. Sony's new CT370 is one of the more discrete and well-implemented ones we've seen. At 5cm high it should fit under most TVs, and the included subwoofer can sit flat or vertical as desired. There's even Bluetooth connectivity with NFC pairing, so you can use it to play music from your smartphone or tablet when you're not watching telly. Neat.



MOTOROLA MOTO 360

$TBA | MOTO360.MOTOROLA.COM

2014 might unofficially be the year of the smart watch – we've already seen a half dozen new models launch this year, with even more on the way – but they've all had one pretty common weakness as far as we're concerned: they're all square. Well, OK, there are a couple of rectangular models too, but that doesn't change the fact that they all use screens with corners and right angles, whereas most traditional watches are circular. The Moto 360 looks to change that with a round face. Of course, that'll certainly affect usability, and so how well Motorola (and Google) deal with that UI element will probably be the thing that makes or breaks this (potentially) round-screened option. Maybe in the future, smart watches won't just be for squares...

Healing the Rift

While valiantly trying to keep down his lunch, Dave James takes another hands-on look at the Oculus Rift.

The Oculus Rift is a future of gaming. It's not necessarily *the* future of gaming, but it's a big step forwards from the traditional gamer/screen interaction. The initial developer kit for the latest, Carmack-sponsored stab at consumer virtual reality (VR) arrived just over a year ago in March 2013. Back then, a lot of us feared that it might end up sharing the same fate as stereoscopic 3D – namely that it would fall short of expectations before quietly slinking off into the technological wasteland.

Since then, momentum has gathered rather than dwindled away; and with the recent release of the second-generation dev kit from Oculus, that's only likely to continue.

The wide appeal of VR was aptly demonstrated when we got the original dev kit into the office for testing. Straight away, there was a crowd of colleagues gathered around our desks, intrigued by the possible glimpse of the future. We found ourselves employed placing people's hands on the WSAD keys and helping them find the mouse while the Rift clasped their heads. And it wasn't just the gamers – everybody was keen for a piece of the action.

But there were a fair few problems with the first kit. The main one being the prototype display, with a resolution of just 1,280 x 800 on the main screen, meaning the Rift splits that low res into a miserly 640 x 800 pixels per eyeball. With the magnification effect from the lenses, this means you can see the grid pattern of the individual pixels overlaying the image behind it. It also means that you can't read any normal-sized text in game, which is a serious problem for gamers that like to read...

The Facebook buy-out

Is the social networking giant's Oculus acquisition crisis or opportunity?

Back in March of this year, Facebook purchased Oculus for US$2 billion — a move that was met with anger by the more militant quarters of the gaming community, and accusations that by accepting the deal Oculus had sold-out and betrayed the reborn VR movement. *APC*'s US sister mag *Maximum PC* (both titles are published by Future) recently spoke to founder Palmer Lucky, who was quick to dispel the idea that Facebook's involvement would mean the end of Oculus as a product for gamers. Specifically, he stated that there'll be no Facebook branding and that the Oculus team remains autonomous — and confirmed that no, you won't need a Facebook account to use it. We remain cautiously optimistic.

BLEURGH...

Then there's the motion sickness. Some people experience nausea as soon as they put the headset on, while others don't notice any problems for half an hour of play. Some lucky folk don't feel anything at all. Oculus claims the problem is related to the full persistence display in the first dev kit. That means there is a serious amount of motion blur as you move your head around in the game world. This disconnect gives that creeping nausea when the action starts.

The new Rift cuts down on the motion blur that the earlier version suffered from.

The Rift's latest incarnation has cleared up some of its predecessor's issues.

"We definitely had some problems keeping our lunch down after barrel rolling around *Elite: Dangerous*' asteroid fields."

Both of these problems are what the new Development Kit 2 (DK2) aims to solve. If you saw any of the Crystal Cove demos from CES in January you'll have an idea of what to expect. The 1,920 x 1,080 screen – or 960 x 1,080 per eyeball – sorts out most of the resolution problems and reading text. The pixel grid effect should also be greatly reduced from the v1 prototype's screen.

Oculus has also changed the puke-inducing motion blur problems the lower-res screen suffers from. Making the switch to a low-persistence OLED display should maintain clarity to the image, even during twitch gaming movements. Low-persistence means that the display only shows a given frame for a short amount of time and it will then go dark until the next frame is shown. If this operates at a high enough frame rate it this stops the blurring of one frame into the other.

We're not 100% sure if that will eliminate all the sickness issues – some of that must come from a certain amount of confusion that your brain experiences from seeing movement and not registering it with the inner ear. We definitely had some problems keeping our lunch down after barrel rolling around *Elite: Dangerous*' asteroid fields.

This second kit also introduces positional tracking. The head-tracking of the first device only works from a fixed point in the game world, while the new setup tracks the movement of the head laterally in space from a fixed starting point. Lean forward in your seat and the same movement will be translated into your Cobra MKIII's cockpit – suddenly you've got an easy zoom mode factored into your game.

CONTROL YOURSELF

That does mean devs are going to have to go back to the drawing board to a certain extent when they're coding for the new Rift. Though any title that has a TrackIR profile – and there are quite a few – will already have code that works with positional head-tracking.

Devs are going to have to learn other tricks to optimise for the Rift – mainly in the way that we control games. On the PC, we're used to having all the keys on a keyboard available for control; realistically, the only way to make sure you don't get lost is to switch to a joypad; a big task for some types of PC games.

They may also need to change the way that we move in-game. The VR spin of *Half-Life 2* is probably the best implementation of the Rift that we've seen, but even here we found ourselves strafing far more than we're used to in real life. Again, it's those odd movements that may contribute to the icky feelings of motion sickness.

Oculus VR CEO, Brendan Iribe, confirmed at the Games Developers Conference (GDC) in March that this was only another step on the way to the final consumer version. Iribe gave no specifics, but did say that every part of the device, including the screen, is going to be improved upon. The DK2 is currently available on pre-order for $350, but whether the final build will remain so cheap is unclear. Hopefully the increased production numbers on a release device will offset the higher component costs. ■

Blue pill or red pill?

Sony is getting a slice of the VR action with Project Morpheus

Sony is also looking at the burgeoning VR movement and is bringing it to the PlayStation 4 console. Code named Project Morpheus, the Aperture Laboratories-looking headset works on the same principles as the Oculus Rift. It's got a full 1080p screen, again split per eye, and a 90° field of view. That's a little less than the Rift in terms of the overall FoV, but that's a kind of fuzzy number that the specs sheets are talking about. Again, the Morpheus includes both head-tracking and positional tracking. Plug it into the PlayStation Camera and it'll accurately track orientation as well as movement.

Why is this important to us PC people? Well, if PlayStation's VR efforts pick up a decent amount of traction in the mainstream, then it should encourage more and more developers to code VR support into their titles. And if they're cross-platform titles then that support should make its way over into PC gaming and that's only going to help the Oculus Rift.

There's also the intriguing possibility that Sony may not actually limit support for it to the PlayStation console alone. If they were to open it up across multiple platforms, then that should increase the competition. And that is a great thing for a new technology.

tech notes

EPINIONS

Windows 8 comes into its own on a tablet interface.

BACK ME UP!

I am endeavouring to buy a copy of *APC* magazine Issue 401 (April 2014). I've been to loads of stores and just can't find it anywhere. I can find Issue 402 (May 2014), but not 401. Is there any way that I could get a copy? A friend told me there are aspects in April's issue which would be helpful to me regarding backup. I'm impressed with the copies I have seen and like to support Australian efforts!

Rae Poole

Ed replies: *Thanks for the email and for reading APC! Sorry to hear you've had troubles tracking down a copy of the April issue – generally, retailers will return any unsold copies of the mag when the next issue comes in, which means they don't physically have any left over. We'd love to send you one from our office stock, but these have all been snatched up too unfortunately! However, you can acquire a digital copy of April from one of two places. If you own an iPad, you can get it from the iTunes App Store:* ***https://itunes.apple.com/au/app/apc-australia/id722803923?mt=8****. If you have an Android tablet or you wish to read us on your PC, you can get it from the Google Play Store here:* ***https://play.google.com/store/newsstand/details?id=CAowyoeZAQ&cdid=magazineissue-CAAqBwgKMMqHmQEw2Md_****. Note that you'll need to use Google Chrome to be able to read this on a regular PC, as other browsers don't seem to work with the 'virtual mags' that the Play Store offers.*

We hope this suits your needs, but please let us know if there's anything further we can help.

NOT SO BAD AFTERALL

I'm a long-standing user of Linux – my desktop and laptop both run Mint KDE, and my tablets run Android Kit-Kat. Needing to be able to fill out OH&S documents on site – and those documents being created on Libre-office – I was having difficulty adapting my tablets for the job.

Although having sworn to never again purchase a Windows system, I found myself considering a Windows 8 tablet as the answer to my problem. I could run Libre-office and Thunderbird on it, while having access to MS Office as well. Long story short, I spied an HP Omni 10 tablet and decided to give it a go. I'm very happy with it! I restored the Start button (Windows 8 Shell), set the desktop as the default screen and Windows 8 comes into its own on a tablet. I didn't much like the onscreen keyboard until I discovered the hand-writing recognition mode (which I'm using to write this). This is a fabulous tablet for$399. It doesn't replace my Sony Xperia Tablet at home, but at work it's in a class of its own.

Peter Henderson

NOT HAPPY, MICROSOFT

I recently had one of those "I wish there was an undo button for this" moments.

I have a PC running Windows 7 Pro 64-bit. I decided to try Linux Debian which installed OK, but it decided to overwrite the boot sector of my C: drive. In hindsight I should have disconnected this drive, but now I have no Windows 7.

I have a recent system image, and a 64-bit repair disk but, numerous attempts to transfer the image back onto the C: drive failed with error code 0x80042302.

A search of the internet showed that this is a frequent error, mostly due to system restore problems.

I tried the Microsoft Windows Live forum, and was referred back to a solution from late 2010, which involved various procedures, including messing with the registry. This did not work for me, the procedures involved files which are not on the system repair disk, so it was doomed to failure. Now the Microsoft Windows Live forum is no longer interested in helping.

I took the disc containing the image, together with my hard drive to my son, who has been in IT for 20 years. He could not fix the problem either. He then came to our house and spent several hours with no success, other than to mount the image so that I could access files, but not run Windows.

The system image folder contains several files in addition to the actual image, and I presume that these are needed to complete the transfer. I have copied the MBR copy and the boot sector back onto the beginning of my C: drive using the LSoft disk editor, but this did not work either. I have also used the disk editor to copy the image onto drive C:, but this did not work.

I would appreciate any help, before I have to face the horrible task of starting from scratch, which will probably take over a week, and will decimate my 15GB internet download limit.

I think Microsoft have a lot to answer for by making users feel that having a system image and a repair disk will overcome any disk crash problems they may encounter.

Don Riley

APCMAG@FUTURENET.COM

Come on, have your say!

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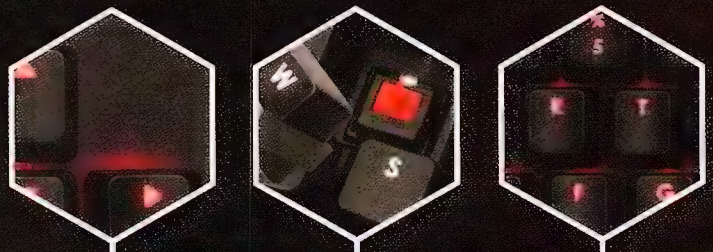

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technotes

END USER

Jungle warfare

The controversy surrounding Amazon's price war with book publisher Hachette shows the ugly side of online shopping's biggest success story.

Amazon doesn't dominate the Australian online retail experience quite the way it does in the US, perhaps for a couple of reasons. For a start, shipping costs. While Amazon's prices often undercut many of its competitors both online and offline, the expense of getting your item(s) shipped to Australia can significantly reduce the discount. Second, product limitations. Amazon doesn't ship all of its items internationally, with the company's own tech products often suffering long delays before they become available locally (if at all). But nonetheless the company, more than any other, has come to represent the public face of the online shopping revolution, supposedly embodying all its benefits to the end user: convenience, expedience, cost-effectiveness and the broadest possible product range.

amazonkindle
Everything begins with a
Toronto, one month early
my father not even able to receive me. He was
mother had always imagined she, too, would be
ended up in Toronto with me in her arms, and
could see the snow whirling. Like those flakes
other places: Flushing, Queens, and then Elmw
grew up in enclaves of Sikh immigrants, who—
India but had also brought it with them. And so
within a country, my parents trying to re-create
to them.
10%
Locations 32-45

"Its willingness, capacity and determination to inconvenience and frustrate shoppers looking for Hachette titles right now clearly demonstrates the opposite."

That's the idea, anyway, which is why the recent controversy surrounding Amazon is so damning. The company is currently embroiled in a price war with French publishing house Hachette over ebook pricing, with Amazon pressuring Hachette to sell its titles at lower prices. The publisher, for its part, is resisting Amazon's efforts in an attempt to defend its business and margins. While Amazon's aim in this – lower prices for book shoppers – is something most readers would usually be happy about, what's so sensational (and ultimately threatening) are the business tactics Amazon has been using in order to coerce Hachette into playing ball.

In addition to delaying its shipping on Hachette titles (pushing shipping dates to weeks instead of days due to a newly implemented policy of reduced inventory on Hachette titles), the online retail giant has been accused of raising prices and reducing discounts on Hachette books, de-emphasising Hachette titles on the Amazon web store – while pushing alternative books, by suggesting similar items from different publishers at lower prices – and removing pre-order facilities for unreleased Hachette books.

The net result of all these techniques is clearly intended to have a detrimental effect on Hachette's sales, presence and availability on Amazon in the short if not long term – but the broader implications of Amazon's heavy-handedness and what it means for readers and the publishing industry at large are what has stirred the hornet's nest. While Amazon claims it is ultimately acting on behalf of its customers by negotiating for lower ebook prices, its willingness, capacity and determination to inconvenience and frustrate shoppers looking for Hachette titles right now clearly demonstrates the opposite is true. To get what it wants, Amazon is not above breaching its celebrated #1 business directive: caring for the customer.

Critics of Amazon's conduct, including authors, publishers and readers have been unsparing in their condemnation, likening the company's tactics to extortion and demanding regulatory intervention. Writer Sherman Alexie tweeted: "Like all repressive regimes, Amazon wants to completely control your access to books." Amazon's response – viewable in full at **tinyurl.com/mj9qco2** – so far has been relatively muted: "Hachette has operated in good faith and we admire the company and its executives. Nevertheless, the two companies have so far failed to find a solution. Even more unfortunate, though we remain hopeful and are working hard to come to a resolution as soon as possible, we are not optimistic that this will be resolved soon." ■

ENDUSER

Share your stories!

If you have an interesting story about technology users, their experiences and the issues that affect us all (whether funny or serious), email us at **apcmag@futurenet.com**. All correspondence becomes the property of APC and is subject to editing. Letters must include writer's full name, street address, suburb, state and phone number to be considered for print publication. Address and phone details will not be published.

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"Linksys is bringing things back to where they began, promising a powerful but modifiable router."

It may look like it's from 2004 but there's plenty of 2014 tech inside.

There's both USB 3.0 and eSATA ports around back.

ROUTER

$300 | WWW.LINKSYS.COM

Linksys WRT1900AC

It's been a decade coming, but is Linksys's new 'open source' router biting the hand that feeds?

About 10 years ago, Linksys paved the way for routers which ran free and open source software. Its WRT54G router was the first to be built on open-source code, and as part of its licence Linksys had to make the firmware publicly available. This expanded into the Linux-based OpenWRT software, which lets you tweak just about every element of your router. Other big router makers like ASUS, Buffalo and D-Link followed suit and included the option to install custom firmware. With the WRT1900AC, Linksys is bringing things back to where they began, promising a powerful but modifiable router.

Set up is straightforward: screw in the antennae, plug it into the mains and connect it to your modem. Linksys includes a CD-ROM to get it going, or you can browse on a connected device to **linksyssmartwifi.com**. By signing up for an account you can access the router and your network from afar. It's not quite as comprehensive as setting up a NAS drive, but being able to see who's accessing what on your network has its uses. Parental controls are also available here, and you can create a blocklist of sites.

With a 1.2GHz dual-core ARM processor and 256MB of memory, the WRT1900AC has the bones to handle lots of network activity. It supports superfast 5GHz AC networking, and it gave our Netgear R7000 a run for its money in terms of speed. We did have some problems with distant devices failing to connect, however.

Other cool features include a QR code generator which can be used to connect camera-equipped devices via Wi-Fi, a guest network, and media prioritisation for certain apps (such as Spotify and Skype) and games. It's all well-presented and easy-to-use, but it lacks the deep, intricate customisation we love to see on routers.

This is where OpenWRT comes in. You can replace the firmware with the open-source OS and then delve into the fundamentals of how the router works, fiddling with BitTorrent clients, running servers and creating VPNs. The internet is full of reports of problems in getting OpenWRT to work with the WRT1900AC, and patches released by Linksys have previously failed. However, we got the latest OpenWRT software (Barrier-Breaker) up and running on the router with very little effort. At the time of writing it's only a couple of days old, and as a result the build hasn't been fully modded by the community. The good news is, it gets that vital 5GHz AC networking up and running in our Wi-Fi blackspot; the bad news is, it drops out completely during large file transfers.

This is a shame because we really wanted it to be Linksys' comeback after a troubled few years. It was bought from Cisco by Belkin, who promised to keep up the quality. But the furore over patches and drivers has alienated the very market Linksys wished to engage.

Without OpenWRT this is only a fairly average router in terms of functionality, and it's hard to say it's worth the price. If you're like its retro looks we recommend waiting for the OpenWRT and DD-WRT communities to sort out the firmware – and waiting for the price to drop. At the moment the Netgear Nighthawk R7000 we looked at in *APC* February is cheaper, and its firmware support is far more mature.

■ Henry Winchester

Verdict

Features	★★★☆☆
Performance	★★★★☆
Value	★★★☆☆

As it stands, a pricey router with a few nifty features, but flaky open source support and poor 5GHz connectivity.

★★★½☆

"The pricing of the Intel NUC is a little deceptive as the box is usually sold as a barebones unit."

apc RECOMMENDS

MINI-PC

$450 | WWW.INTEL.COM

Intel NUC D54250

This mini power house from Intel brings cutting-edge technology to almost any scenario.

Intel's line of NUC mini PCs have been out for well over a year now. The original two NUC models – unhelpfully named the DC3217IYE and DC3217BY – were released towards the end of 2012 and managed to make enough noise in the industry to gain a fair bit of attention. A year and a half on and Intel has refreshed the range with Haswell-powered systems and a revised chassis, which is even smaller. So why has it done so well?

Intel called the new range 'NUC' which stands for Next Unit of Computing. It's something of a pretentious name considering it's simply a small form factor system that's proprietary to Intel. We used the evil 'p' word, but in the hardware world companies seem to get away with bespoke designs. And it's a very neat and tidy design – the NUC board measures just 10.16 x 10.16cm and the dinky chassis (at 116.6 x 112 x 34.5mm) means it's small enough to hold in one hand.

Intel can get away with this as the motherboard is designed to be self-contained and largely unexpandable beyond the base slots provided. The processor is soldered directly to the motherboard with a bespoke cooling solution, which in general use works almost entirely silently.

This model has the Intel Core i5-4250U. The 'U' denotes that it's a low-power model consuming just 15W of maximum power. It's a dual-core 1.3GHz processor with Hyper Threading, and supports Intel's Turbo mode up to 2.6GHz, which is kind of an official automatic overclocking feature. Importantly this Haswell model also uses the newer Intel HD Graphics 5000, so it's capable of playing modern games at 720p resolutions at acceptable (if low 20s) frame rates. In addition to it using such a modern processor, it has Intel Quick Sync and Wireless Display technologies, supporting video output on new 4K displays over its micro-HDMI and Display Port connections.

It's partly this cutting-edge nature that can bring issues to less cutting-edge users. So you'll need to invest in micro-HDMI connectors or a Display Port capable monitor. This goes down to the memory used inside the NUC, which is the more recent 1.35-volt DDR3 SODIMM memory rather than the old 1.5-volt type more widely available. The twin SODIMM slots support up to 32GB of memory, and alongside them internally are two PCIe slots for an mSATA SSD and wireless card, for which the NUC comes pre-installed with twin wireless antenna.

This latest revision comes with minor but useful upgrades on the older range. It has four USB 3.0 ports, over just the three USB 2.0 ports of old. It includes a wired Ethernet port, too. Intel has also seen fit to add an analogue headphone output and infrared sensor at the front: both useful for home media systems. Additionally there's an internal USB 2.0 header and STAT port.

The pricing of the Intel NUC is a little deceptive as the box is usually sold as a barebones unit. So that $450 price quickly grows when you add memory, storage and a wireless card, to a less attractive $700. But is that bad? For a box as capable as this – no. But if you're just after a media centre box, this could be overkill when a $50 Raspberry Pi could do a similar job. ■ **Neil Mohr**

Verdict

Features	★★★★½
Performance	★★★★½
Value	★★★½

A finely engineered system that, while limited on expansion, offers plenty of power... at a price.

★★★★☆

apc RECOMMENDS

Verdict

Features	★★½☆☆
Performance	★★★★½
Value	★★★★☆

With amazing battery life, attractive design and good build quality, this doesn't feel like a budget notebook.

★★★★☆

ULTRABOOK

$TBC | DELL.COM

Dell Chromebook 11

Is Dell's first Chromebook up to scratch?

It's official: manufacturers are hot on Chromebooks. Toshiba recently came out swinging with its first browser-powered machine, and now Dell has followed suit. While a choice of more laptops is always good news, however, Chromebooks have grown very samey. Other than some new Google Now implementations and an expanded app store, there has been little change to Chrome OS, Google's cloud and browser-focused operating system, since it first debuted in May 2011. As a consequence, the hardware doesn't vary much either. Save for the Chromebook Pixel, options across the board largely look the same, with barely-HD screens and an emphasis on power-saving components – these are budget machines, after all. So, can Dell break the string of monotony for Chromebooks and bring something new and exciting to the table?

The Dell Chromebook 11 makes a great first impression, with a simple yet elegant design. The bulk of the 11.6-inch notebook's outer shell is made of a charcoal matte plastic, with a rubbery black coating covering the outside edge of the screen bezel and keyboard deck as well as partially spilling over the sides of the device. There isn't anything that shouts budget about this Chromebook, either – it doesn't feel much different from some of the company's other laptops. Overall, the build quality is solid, with minimal flex even in the middle of the keyboard.

Physically, the Dell Chromebook 11 is smack in the middle of the pack of 11.6-inch Chrome laptops, measuring in at 29.5 x 20 x 2.5cm (WDH) and weighing 1.32kg. It's barely lighter than the Acer C720P Chromebook, which is 0.5cm thinner. It's just a shade thicker but over 200g heavier than the HP Chromebook 11.

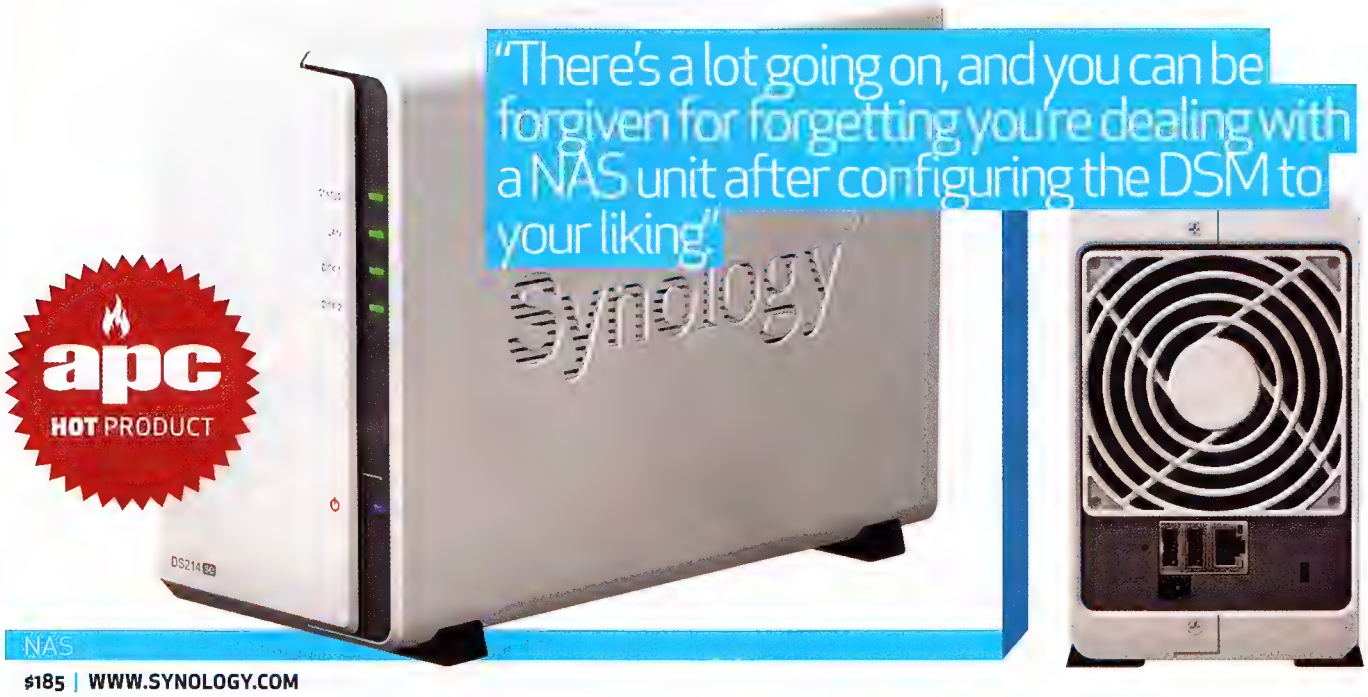
Externals aside, hardware specs are where all Chromebooks start looking identical, and that's no different for this Dell unit. We tested a 2GB version of the Dell Chromebook 11. It has a 16GB SSD, one of the niceties that's appearing on more and more Chrome OS machines – as most Chromebooks live purely on cloud storage with 100GB of free Google Drive storage for two years, there's no need for a heavy and sluggish hard disk drive.

Part for part, the Dell most closely resembles the Acer C720P, with the same 1,366 x 768 resolution screen and even the same CPU. Our only quibble is that the screen has a bluish cast and could do with better contrast.

Despite our best efforts to completely run down the battery as quickly as we could, the Dell Chromebook 11 put up an amazing fight for an outstanding eight hours and 22 minutes. Even under the most intensive loads, the battery meter never dipped below a projected five hours. With regular use – setting the screen at 65% brightness, listening to Spotify, and working on Google Drive – we could easily see the battery life stretching to 10 hours, or even 12 hours by lowering the screen brightness and staying away from YouTube. This is a laptop you can leave the house with and forget the charger.

The Dell Chromebook 11 is neither a bold new move for Chrome OS nor does it add any revolutionary quirks to the Chromebook hardware. Aside from the disappointing screen, this is simply a solid laptop that's well built and attractive. The Chromebook design has finally settled into a groove, allowing manufacturers like Samsung and now Dell to craft more appealing aesthetics.

However, it's clear that Chrome OS has yet to mature. The platform is almost three years old, and still Google needs to clean up the Chrome Web Store – not to mention attract more third-party applications – if it has any hope of making its operating system appeal to a wider market than students and professionals wanting a budget notebook for light office work. In the meantime you can always install good old Linux for more functionality. **Kevin Lee**


"There's a lot going on, and you can be forgiven for forgetting you're dealing with a NAS unit after configuring the DSM to your liking."
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Synology DS214se

NAS units may come and go, but the Synology DS214se has an ace up its sleeve – and that ace is Linux.

Synology is a company with an outstanding reputation in the NAS industry. It produces quality hardware, engineered to last and to provide the best possible access for the individual.

It also has an intuitive Linux-based OS built in to each of its DiskStation and RackStation models. So when got our hands on the DS214se NAS unit, we were excited.

The feature list is impressive; with a Marvell Armada 370 800MHz CPU and 256MB of DDR3 memory running things in the background, this two-bay NAS unit can handle up to 8TB drive configurations in RAID 0, 1, JBOD, Basic and a Synology Hybrid RAID. It has a low-power consumption rating, a mere 19W, and it's fast enough to serve your home network with HD content at speeds measuring up to 55MB/s reading, and 40MB/s writing.

There are two USB 2.0 ports on the back, along with a single Gigabit LAN port and power. The front of the unit is uncluttered and features a strip of identifying LEDs that indicate the status of the system, LAN activity and activity on each of the two installed hard drives.

It's presented in a sleek, elegant white plastic case with sizable rubber feet and the Synology name acting as a vent across both sides. It's reasonably compact, too, measuring 165 x 100 x 225.5mm and weighing only 0.87kg (excluding drives).

Installing a hard drive is a breeze: simply slide one of the panels and the unit and the SATA ports are revealed, along with a frame on which to mount each of the drives. Once installed, the rest of the process can be managed via the Synology DSM (DiskStation Manager). Here is the real star of the show – a flexible and very functional Linux-driven interface that's leagues ahead of the competition.

The latest DSM is downloaded and installed once the unit is up and running and taking over the drive(s) installed; this means you'll have the most up-to-date version to hand, without the need to compare version numbers for installed features. From here, maintenance and administrative tasks can be accessed without the need to trawl through the usual nested menus.

The DSM is quick, easy on the eye and intuitive; there's a handy system health, resource monitor, log viewer and current connections gadget. The layout is the same as that of a standard Linux desktop, so navigation feels natural, and integrating new features is a single click away through the package centre, acting very much the same as a GUI package manager.

It's the level of detail, ease of use and quality of the operating system that make using this NAS unit less of an administrative chore and more of an extension to your desktop. Different packages can be installed, updated and configured. Web services, users' administration, router configuration and firewall settings can all be managed through the control panel. There's even access to the DSM terminal through SSH or Telnet.

There's a lot going on, and you can be forgiven for forgetting you're dealing with a NAS unit after configuring the DSM to your liking. However, it does an admirable job of being a NAS for the home or small office, and thanks to the wonderful DSM you can guarantee you're getting an exceptional device. ■ **David Hayward**

Verdict

Features	★★★★★
Performance	★★★★½
Value	★★★★½

An excellent, reasonably-priced NAS unit. Plus, the installed DSM is a dream to use and manage.

★★★★½

GRAPHICS CARD

$898 | WWW.ASUS.COM

ASUS ROG Matrix-R9290X-P-4GD5

Is ASUS's Matrix 290X 'the One' when it comes to AMD's top-end Radeons?

In the opening scenes of *The Matrix*, Neo has a choice: to take the blue pill and return to a faux reality, or take the red pill and discover the real world. ASUS has delivered a new 290X Matrix and like in the movie, it's a bit of a red pill that's pretty unbelievable.

As we expect from ASUS's Matrix line, this card sports the trademark black-and-red Republic of Gamers colour scheme. ASUS has gone with a two-slot cooler which uses their new CoolTech multi-directional cooling technology. The fans are backed by 10mm direct-touch heatpipes, which keep the card cool and quiet. All of this cooling technology is directed at the 290X GPU which runs at 1,050MHz – a 50MHz increase over the reference card.

The memory has also been raised from 5,000MHz to 5,400MHz, with abundant headroom for further clocks. ASUS has also reworked the PCB to accommodate a 14-phase power delivery system. Also taking advantage of the expanded PCB is a 'memory defroster' – and this is where things start to get unreal. For those wanting to push their cards to the extreme (and we mean dry ice, liquid nitrogen extreme) the memory defroster will ensure your memory is never covered in ice.

Also on-board is a LN2 mode jumper switch, unlocking clock limits and voltages in the GPU Tweak software. This is, overall, an amazing graphics card with incredible features and unmatched performance. However at over $200 more than a reference 290X, it does pose the question: Do you really need all of these bells and whistles?

James Trevaskis

Verdict

The most feature-rich Radeon R9 290X on the market, but few of us really need all those features.

★★★★½

GRAPHICS CARD

$889 | AU.MSI.COM

MSI R9 290X Lightning

Lightning keeps striking; debunks striking-twice myth.

We just presume that MSI's Lightning cards are going to be amazing. The Lightning range has sat at the top of the performance VGA market forever and the latest Lightning-powered Radeon R9 290X release is no exception.

The MSI designers must listen to way too much of rapper Wiz Khalifa – as once again this card is decorated in his signature black-and-yellow colour scheme. (We kid, of course!) There are no objections from us, the colours and new triple-slot cooler combine to make one amazing-looking card.

The cooler does a great job, but the three-slot design can potentially block useful motherboard slots. A 15-phase power delivery system provides more than enough juice to maximize performance and lifetime of the card. As a result MSI has been able to push the GPU core frequency to 1,080MHz out of the box, an impressive 8% increase over the stock 1,000MHz. After increasing the GPU voltage with MSI Afterburner, we ended up with a stable 3DMark frequency of 1,300MHz for the core and 6,800MHz for memory; that's the highest we've seen on a stock cooler. We then tried for even higher frequency on water cooling and had no problem running benchmarks at core speeds of 1,375MHz.

The Samsung-made memory is very efficient, delivering high performance at lower clock speeds. Our testing found 1,700MHz memory on the Lightning is equal to around 1,750MHz on most other cards. In short, MSI has once again delivered a near perfect graphics card. Our only gripes are the high price and bulky cooler.

James Trevaskis

Verdict

A massive card — in terms of performance, size and price.

★★★★½

GAMING HEADSET

$130 | WWW.FUNC.NET

Func HS-260

Func's foray into gaming headsets starts on solid footing.

Func's not a new brand – it's been making gaming mousepads since the turn of the millennium – but its recent foray into mice and keyboards represents quite a step up. Now, with the HS-260, Func is ready to complete the trifecta and take on gaming headsets as well. And while it's not without flaws, as a first effort the analog HS-260 is very promising.

It's a big, well-constructed set with circumaural earcups that are large enough to provide plenty of room for everyone. The plastic band is adjustable and pivots lightly where it meets the earcups, making for a flexible fit.

The HS-260 comes with interchangeable fabric and leatherette earcups, and we found both nicely padded and very comfortable. This is a seriously heavy unit, however, and though the headband is padded, it's not quite thick enough; the "clamping" of the HD-260 is actually a little lower than average, but this does leave most of the weight bearing right down on the top of your head. All those factors can combine to cause discomfort.

The HS-260 is fairly light on features – there's a single control on the set itself for volume, along with ports for the removable braided audio cable and mic. Acoustically, it doesn't do much to stand out. Like most gaming headsets, it's heavy on the bass, though the overall sound is a little lacking in power. The highs and mids are passable, but indistinct—for music.

Overall, there's not too much to make this particular unit stand out from the pack, but we'll be watching to see what Func comes up with next.

■ Alex Castle

Verdict

Good build quality and solid design are slightly undermined by heavy weight and middling sound quality.

GAMING HEADSET

$150 | MIONIX.NET

Mionix Nash 20

Great PC gaming sound without any of the showmanship.

They're not, colourful or flashy, you can't add flair or change the tag and you're not likely to see them flaunted by your favourite Twitch.TV streamer. The Nash 20 from Mionix is all utilitarian business; they have no aspirations to be anything but a solid gaming headset. And that's why we like them so much.

The Nash 20's super rigid, matte-black, soft-touch plastic and aggressively horse-shoed headband looks uncomfortable, but – like a rifle that only shoots marshmallows – in practice it's a dream come true. The oversized cans themselves float within the frame and feature a surprising range of pivot for auto-adjusting to the noggin.

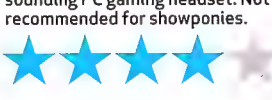
Rounding out the remainder of the feature list is a small – probably a little too small – volume scroller behind the left can, plus a boom mic that unmutes itself with a satisfying click as it swings into action. A little more mouldability in the mic arm would have been nice aesthetically, but we never had comms issues in our testing.

The semi-closed design allows just enough air to circulate amoungst the drivers, which improves the overall soundscape without sacrificing the passive isolation that closed-back systems offer. It's a nice balance and definitely something we'd like to see offered from other brands. It also helps that they sound fantastic.

We do harp on about headset utility and sadly this is where the Nash20 slips; there's no quick-release cabling, removable mic and you're unlikely to travel with something so big. ■ Troy Coleman

Verdict

A robust, comfortable and great-sounding PC gaming headset. Not recommended for showponies.



SMARTPHONE

$899 | WWW.HTC.COM/AU

HTC One (M8)

Last year's best phone gets even better

The HTC One was the best phone of 2013, so expectations were high for its successor, the One M8. And the great news is that HTC has improved the flagship in almost every way.

Aside from HTC's terrible handset naming structure, the Taiwanese company has packed the One M8 with top of the line features. The brushed aluminium frame now incorporates a microSD card slot for additional storage – which overcomes our biggest concern with last year's model – while now including a five-inch screen, without a massive increase in weight. Low-power mode gives you plenty of emergency juice when you're running low by switching off all but emergency functions, and it works a treat.

But it's not all good news. The headphone jack has been pushed to the bottom of the phone, which is an awkward design shift. The HTC One's 4-megapixel camera hasn't had an upgrade either. While its 'Ultrapixel' sensor does a good job of capturing low light, the camera doesn't feel like it has improved compared to the likes of the Galaxy S5 or Xperia Z2. But everything else in this phone is superb. The Boomsound front-facing speakers sound majestic when compared to rival handsets, the TV app and IR blaster plugs in to Aussie services and is easy to use, and the BlinkFeed news services is a truly useful service for catching up with relevant information. HTC has even done fitness the smart way by partnering with FitBit to turn the One M8 into a mobile step tracker. Simply put, this is the best phone HTC has ever made, and the current frontrunner for phone of the year. ■ Nick Broughall

Verdict

Somehow HTC has managed to take all our criticisms of last year's HTC One and fix them with the One M8.

★★★★★

SMARTPHONE

$894 | WWW.SAMSUNG.COM/AU

Samsung Galaxy S5

A triumph of technology let down by clunky Samsung software.

Given Samsung accounts for the vast majority of Android devices on the market, expectations were high for the fifth generation Galaxy S smartphone.

Like last year's S4, the Galaxy S5 is packed full of technological advances designed to make the phone the centre of your life. From a fingerprint scanner integrated into the home button to the 16 megapixel camera, Samsung has tried to offer something for everyone. Most of the time, it works. The camera is one of the best available on a smartphone, taking great snaps with a speedy autofocus. The fingerprint scanner is mostly responsive, unless you swipe your thumb sideways. Lifestyle features like S Health have been given a significant boost via an integrated heart rate monitor on the back of the phone, but it feels like a gimmick, and the software still doesn't compete with dedicated fitness apps. But the biggest drawback of the S5 is that it doesn't feel like a step forward. The phone feels cheap and plasticky when compared to the HTC One M8 or Sony Xpera Z2. And the Touchwiz software – while updated over last year's version – is still a bit convoluted.

Samsung has again arbitrarily locked the dock on the Australian phone despite it being customisable internationally. You can work around this by downloading a new launcher or by rooting the device, but for the common Galaxy S5 customer it's a disappointment. Make no mistake – Samsung has created a very good phone here. The problem is that its main rivals are noticeably better. ■ Nick Broughall

Verdict

Samsung has packed the Galaxy S5 full of great features, but Touchwiz is still a massive disappointment.

★★★★☆

msi®

SUPPORTS intel inside CORE intel inside CHIPSET Z97

Supports Intel Smart Response Technology

MOTHERBOARD

Z97 GUARD-PRO SOLUTION

Efficiency, Durability, Power, in Perfect Harmony

GUARD-PRO

Circuit Protection

With especially designed circuit protection, the MSI motherboard protects the CPU against overheating and USB devices from short circuiting.

ECO Power

MSI's unique ECO Power technology helps to lower the power consumption by 17% for your motherboard.

Humidity Protection

The latest Gen 4 Fabric PCB helps to prevent moisture caused by some humid conditions and environments

High Temperature Protection

Certified Military Class 4 components enhance stable performance under extreme conditions.

EMI Protection

MSI's optimized EMI protection design helps to keep users safe during prolonged computer operation.

ESD Protection

Anti-ESD ICs and fuses onboard helps to totally protect your motherboard from electrostatic damage.

4K UHD SUPPORT

Ultra-high Definition visual experience

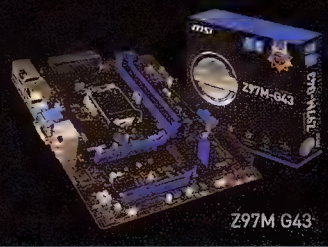
M.2

Onboard M.2 with speeds up to 10 Gb/s

Z97 G55 SLI

Z97 U3 PLUS

Z97 GUARD PRO



Z97M G43

NSW

MSY Technology	02-9726 1997	msy.com.au
ARC	02-9748 8322	arc.com.au
Digital Star	02-8748 6888	digitalstar.com.au
ibuy	1300 10 30 30	iibuy.com.au
IT Destination	02-9211 8696	itdestination.com.au
J&W Computers	02-9726 2818	jw.com.au
The Laptop Factory Outlet	02-9892 0000	lfo.com.au
Online Computer	02-9211 0898	onlinecomputer.com.au

VIC

PC Case Gear	03-9560 2122	pccasegear.com.au
MSY Technology	03-9700 9771	msy.com.au
Budget PC	03-9541 9000	budgetpc.com.au
Centre Com	03 8311 7600	centrecom.com.au
Scorpetc Computers	03-8561 3200	scorptec.com.au
BCC Computers	03-5227 6888	bcccomputers.com.au
CPL	03 8542 8688	cplonline.com.au
PCD International Pty Ltd	03-5222 5189	www.pcdi.com.au

QLD

Gamedude Computers	07-3387 1500	gamedude.com.au
MSY Technology	07-3290 1908	msy.com.au
Computer Function	07-3270 4477	computerfunction.com.au
FTC Computers	07-3344 7100	ftc.com.au
Computer Alliance	07-3421 3200	www.computeralliance.com.au
Gocomp	07-3722 5150	gocomp.com.au
Umart Online	07-3369 3928	umart.com.au

WA

MSY Technology	08-9344 1002	msy.com.au
Austin Computers	08-9202 0100	austin.net.au
PLE Computers	08-9309 4771	www.ple.com.au

SA

MSY Technology	08-8212 1656	msy.com.au

*Keep up to date with the latest from MSI on the MSI AU FB page:

MSI Australia www.msi.com

ASUS®

Z97 Deluxe specs
Intel® LGA1150 support
Dual Channel 3300 MHz DDR3 up to 32GB
802.11 AC1200 Wi-Fi and Bluetooth 4.0
Dual Premium Intel® Gigabit LAN powered by ASUS Turbo LAN
NFC Express 2 and Wireless Charging
7.1 channel Crystal Sound 2 Premium Gaming Audio
6x USB 3.0, 4x USB 2.0
Dual Intelligent Processors
Z97-DELUXE
DIGI+ VRM
TPU
Wi-Fi 802.11ac
SATA 6Gb/s
CRYSTAL SOUND 2

ADVERTISING FEATURE

The ultimate entertainment PC

Choose ASUS components for the best combination of power, flexibility and longevity in your next PC.

For more information on ASUS's new Z97 series motherboards, scan in the QR code below on your smartphone or tablet, or visit **www.asus.com/Microsite/mb/9series**.

When putting together a new high-end PC for entertainment, ASUS makes it easy to get the best performance hardware, no matter if you are overclocking, gaming, working or just watching a movie. You also get an impressive list of features with some of the latest technologies and extras, such as wireless charging and NFC connectivity. They're all great reasons to think ASUS when you build an entertainment PC.

THE DREAM MOBO

Z97-DELUXE

A powerful PC may only be as good as it's components, but the motherboard is what ties the entire system together. The ASUS Z97 Deluxe combines an almost endless list of premium features you need to get the most from your gaming and entertainment machine. Supporting the latest Intel 22nm socket 1150 CPUs, 3300MHz DDR3, SLI (and 3-Way CrossfireX), M.2 and dual SATA express. You also get the latest AC1200 Wi-Fi, Bluetooth v4.0, Thunderbolt 2, NFC, Wireless Charging, dual premium Intel Gigabit Ethernet and 6 USB 3.0 ports (plus another 4 USB 2). It's also got top notch 7.1 channel Crystal Sound 2 gaming audio that sounds great for movies, and is perfect for games.

ASUS ties the board together with powerful 5 Way Optimization Technology that fine-tunes your system to its best shape with a single click, just like having your own dedicated IT manager taking care of the hard work for you. No matter that's in high performance, lower power consumption, or even close to noiseless fan acoustic management with its exclusive Extreme Quiet Mode. Advanced users can even configure different performance, and network profiles, or different audio plug-ins for different applications, which makes it easy to push the boundaries of performance in all aspects.

POWERFUL GRAPHICAL PROWESS, DEAD SILENT

STRIX-GTX780-OC-6GD5

For an entertainment PC, nothing is more irritating than audible fan noise. The STRIX GTX780 features a GTX 780 graphical engine with 2304 of NVIDIA's powerful CUDA cores runing at an overclocked 941MHz boost clock. It also features a massive 6GB of 6008MHz 384-bit GDDR5 memory, double of any GTX780 cards, perfect for memory-critical environments such as 4K entertainment, whether that is in movies or games. Despite the processing grunt, the STRIX GTX780 runs incredibly cool and quiet thanks to the top notch Direct CU II heatsink, consisting of a 10mm heatpipe which has direct-contact to the GPU for up to 40% greater heat transfer efficiency. The absolute beauty of the STRIX series VGA card is the introduction of the 0dB Fan Technology, which, apart from precise management of fan speed, also helps to spin the VGA fans right down to 0 spins when the GPU goes below 65°C, making the card dead silent when doing office work, watching movies, or even light gaming. To keep the card solid, stable and everlasting lifespan, the GTX780 GPU is supported by the award winning 10-Phase Super Alloy power delivery system to give rock stable voltages. Using GPU Tweak you can perform real time overclocking to tweak the system for ultimate performance. Paired with a 1,920 x 1,080 monitor, the STRIX GTX780 can deliver the very highest frame rates, though has enough power to game at ultra high-res like 2,560 x 1,600. For even more power like the supreme 4K gaming environment, you can of course move up to run two of these bad boys in SLI.

SEEING IS BELIEVING

ASUS MX279H LCD

With a powerful PC, you need a high quality monitor to match. The MX279H is right on the sweet spot for size at 27-inch – great for gaming without taking up to much space. Just 17.5mm thick, with a frameless screen, it looks super stylish as well. Importantly the MX279H has the latest in screen technology – a top notch full HD 1,920 x 1,080 LED backlit AH-IPS panel for accurate

STRIX-GTX780-OC-6GD5 specs
GeForce GTX 780 @ 941MHz GPU Boost Clock
2304 Shader Processors
6GB 6008MHz GDDR5 RAM
Dual-link DVI-D / Dual-link DVI-I / DVI / HDMI
PCIE 3.0
The 0dB Fan Technology used by the STRIX-GTX780 can effectively stop the card's fans if the GPU is under 65°C, making the card completely silent.
MX279 specs
27-inch 16:9 AH-IPS LED backlit
1920 x 1080 resolution
5MS GTG response time
Pixel Pitch 0.311 mm
Brightness: 250 cd/m2
Smart Contrast Ratio: 80000000:1
Viewing Angle: 178(H) 178(V)
Dual HDMI Inputs
STRIX OC EDITION
GEFORCE GTX 780
6GB
0dB
DIGI
GPU TWEAK

vibrant colours and extra wide viewing angles. The ASUS Smart Contrast ratio of 80 million to one ensures deep blacks and a sharp image. For gamers, the MX279H uses Tracer Free Technology to eliminate ghosting and give smooth video playback with a 5ms response time.

The MX279H also features ASUS SonicMaster technology – co-developed by the ASUS Golden Ear team and Bang & Olufsen ICEpower. These 32mm drivers use rare earth magnets to give a rich sound with plenty of bass – something you don't find in many monitor speakers. It also takes HDMI audio from your computer and feeds it to a pair of headphones via a 3.5mm jack.

For full entertainment options, such as connecting a gaming console, the MX279H has dual HDMI inputs, as well as a legacy VGA connection.

DIGITAL CONNECTIVITY

Your new ASUS power PC integrates itself into everything you do. Using the NFC Express 2, you can set your PC to log in with one touch or pair with your portable devices. If you are running low on juice, it can top up your Qi wireless charging compatible phone, or continue to watch your favourite movie right from where your portable device left off. You also get Thunderbolt 2 connectivity – an ultra high-speed single cable connectivity option that can handle video and data, future proofing your PC. Your entertainment PC is ready to integrate with your portable devices and cloud services thanks to Wi-Fi GO! You can back up with different cloud services, transfer files, remotely control your PC and stream media.

YOUR ASUS PC IN ACTION

Your ASUS machine may excel at gaming and watching movies, but how are all those ASUS extras working together to give the best experience?

The ASUS magic starts when you first turn on your PC. While you could get hands on and manually adjust your BIOS settings, the ASUS EZ Tuning Wizard means you don't have to. Overclocking your PC is as simple as answering a couple of system related questions and letting the Z97 board work its magic. Once you hit Windows, the 5-Way Optimization Technology puts your system in its best shape with a single click.

For everyday use, Turbo App dynamically adjusts your system to give the best efficiency without compromising on power. If you want to watch a movie, it can lower clock speeds and slow fans until your PC is running silently, while engaging the DTS Ultra PC II Technology to bring you a DTS cinema experience. When you fire up your favourite game, Turbo App loads a custom overclocking profile that you prepared earlier. For a high-end game, it can overclock your CPU for the best performance, while ensuring your cooling profile will keep everything running cool. For some casual gaming, it could be set to run quietly and efficiently, but still with the power you need.

When you have finished gaming, Turbo App switches your system back to a low power energy efficient mode.

It's not just about performance either, when you are gaming TurboLAN priorities your network packets to give the lowest ping and best lag free experience. If you are using your entertainment PC to watch Full HD, or even Ultra HD contents, TurboLAN will ensure adequate bandwidth to stream without any stuttering. On the other hand, Crystal Sound 2 utilises the Hi-Fi audio parts and industry leading engineering power for the true essence of sound that makes you scratch your head wondering where the audio card hides inside your system. Look out for Power By ASUS, you will be amazed by the difference it brings.

ASUS 9-SERIES MOTHERBOARDS SUPPORT THE LATEST 4TH AND UPCOMING 5TH GENERATION INTEL® CORE™ PROCESSORS.

software

» APPS FOR ALL THE PLATFORMS EDITED BY PETER DOCKRILL

Windows SOFTWARE

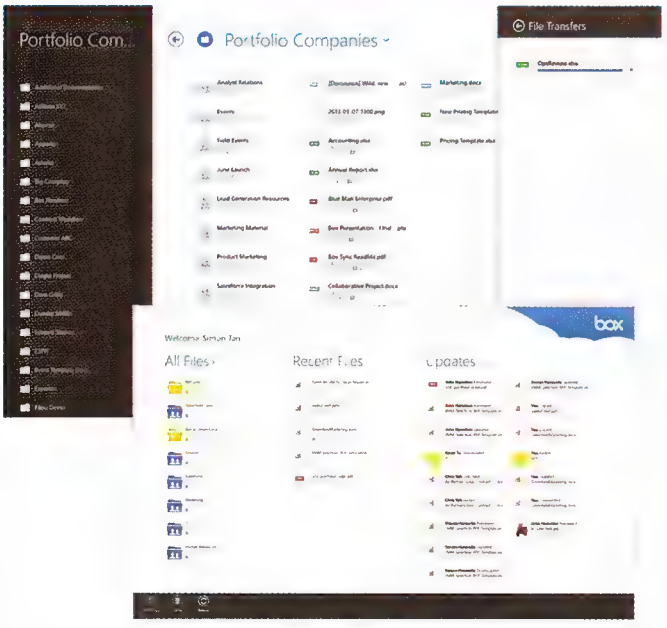
Box

The best bang for no bucks.

FREE | BOX | WWW.BOX.NET

We've discussed the benefits of cloud locker apps many times in these pages, but which is the best if you don't want so spend a cent? Of the current crop of mainstream online storage providers, the best freebie deal is Box. Box's free Personal plan includes 10GB of secure storage with a maximum file size of 250MB.

While that file size limitation means you won't be able to upload much in the way of hefty content like video files or games, 10GB is a still a considerably useful amount of free backup for important personal data like documents, photos and other diminutive digital keepsakes worth safe-guarding in a secure location – in addition to the obligatory external hard drive backup already sitting beside your PC (you do have one of those, right?). Think of your cloud locker as a safe remote stash should the inconceivable happen – such as your house burning down, in which case the first external backup would be as toasty and irrevocable as your freshly smoked PC. By comparison, Microsoft's OneDrive presents 7GB for free, and our

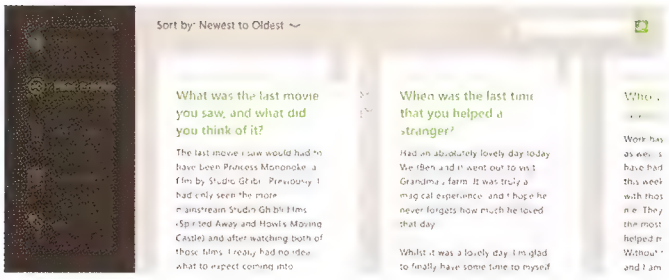


personal favourite cloud locker – Dropbox – only provides a paltry 2GB, the same token free capacity it has offered for years (although additional space can be unlocked via referrals and other means).

2048

FREE | ANDRIS PAKULIS | TINYURL.COM/P4X63WC

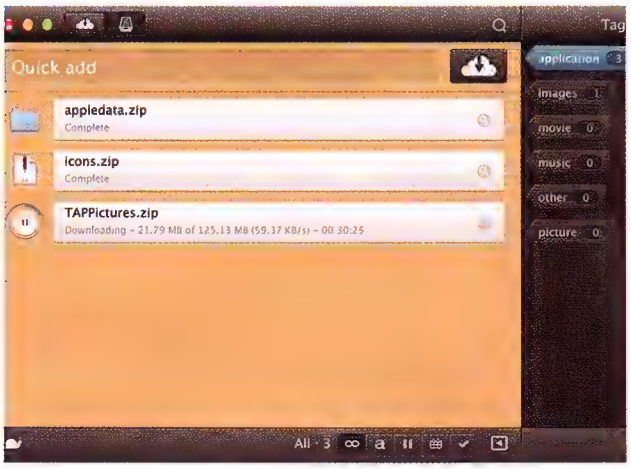
The recent *2048* phenomenon shows just how rife idea theft is in the world of games, and unless they have the money to wage a lawsuit, there's very little software developers can do about it. In short, small indie developer Sirvo released a charming number-based puzzle game on iOS called *Threes*, which within weeks was copied by multiple clones — the most popular, *2048*, became a #1 app and is itself now subject to myriad imitations. Go to any app store, search for "*2048*" and see how many games you come up with. This Windows version by Andris Pakulis plays much like all the rest: it's fun, addictive and at times infuriating, but doesn't include some of the key gameplay refinements which critics contend make *Threes* a superior, more challenging game. Still, until *Threes* becomes more widely available (it's only on iOS and Android), we imagine the clones will only combine and multiply.


Sort by: Newest to Oldest
What was the last movie you saw, and what did you think of it?
When was the last time that you helped a stranger?

Writr

PRICE: $1.99 (FREE TRIAL) | THE IDEAPAD | TINYURL.COM/ODCXV2W

Want to keep a journal but stuck for what to write? Writr aims to conquer any troublesome writer's block by asking you questions to get the personal sharing started. The idea is that, rather than challenge you with a blank page, you simply can provide answers to the questions posed, filling in the blanks of your life as you go, and Writr will painlessly extract a de facto journal from you in the process, almost like a free session on a psychologist's lounge! It seems like a gimmick — and it is — but it's also not a bad way of getting the creative juices flowing and could genuinely help aspiring writers learn how to reach into themselves to share their experiences and start telling stories. A free trial may help determine if it's for you (and $2 is a lot cheaper than seeing a real shrink anyhow).



Folx GO+ 3 Pro

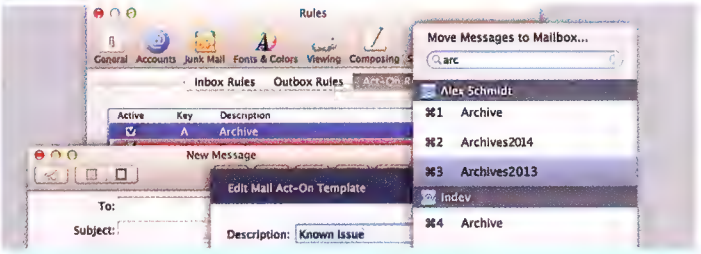
How fast can you go with this new version of the download manager?

US$19.95 | ELTIMA SOFTWARE | MAC.ELTIMA.COM

Folx Go+ 3 is the latest download manager from Eltima. The software is designed to help you more easily manage large downloads or multiple downloads, all in a user-friendly interface.

Perhaps its most interesting ability is to manually set download speeds, so if you want to get a large file, and have the time to wait, you can get it without that one file monopolizing your internet connection. You can split downloads into manageable chunks of up to ten threads too. Furthermore, this new version of Folx Go+ also lets you pause and resume downloads at will, which is fantastic for those really big downloads where you have a slow or patchy connection. In the last version of Folx there was only a limited speed improvement and the same is true again here. But that's not the whole story.

The real benefit is the control over downloads that the software allows. One other added bonus is the ability to add tags to downloads, making it easier to find your stuff when you've collected all your files. There's no doubt that Folx Go+ is a niche product. For most people, the standard downloader in Safari is adequate, but if you're using mobile broadband or a slow connection and need to get hold of large files, this app can really help you out. If you're not sure what Folx Go+ can do for you check out the Free version of the software. All it really lacks is four options, namely the threaded downloads, iTunes integration, automatic/manual speed controls and download scheduling. While Folx won't give huge speed improvements, it does make downloading easier.



Mail Act-On 3.0

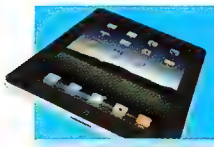
US$29.95 | INDEV | WWW.INDEV.CA

Heavy email users may find Mail Act-On indispensable. It's designed to simplify email management, letting you define rules, create actions for filing and other workflow tasks, and adjust Outbox messages before and after they're sent. Mail Act-On renames Mail's rules to Inbox Rules and adds Outbox Rules and Act-On Rules. Outbox Rules can pre-process mail, for example changing the "from" address when sending to contacts, delaying delivery, or appending text. Post-delivery, messages can be flagged, and alerts can sound. Act-On Rules are similar, but designed for applying to received email, for example to file it with a single keystroke. Making rules is simple. Beyond shortcuts, actions can be performed using Mail Act-On's floating window. During a move action, mailboxes are filtered much like Spotlight results. The process is faster than in the previous version, but the window has less clarity and more visual clutter. A better new feature is templates; these enable you to create boilerplates that include tokens for names and subjects. It's definitely worth a look if you spend ages filing email.

iBetterCharge 1.0

FREE | SOFTORINO | WWW.SOFTORINO.COM/IBETTERCHARGE

The iBetterCharge software sits silently in the menu bar, waiting until any iOS device on the same network (and with "Sync this iPhone/iPad over Wi-Fi" enabled in iTunes) is down to 20% of its full charge. You then get a Notification Center alert to plug said device in. Simple, but also hugely useful. It's an idea that's so obvious and convenient we can't believe Apple didn't think of it first. There are a few options, such as ignoring specific devices, defining at what charge level a notification appears, and whether a second notification occurs when the device is charged. The version we tested had minor issues. The developer already has these on a fix list, and even the version we saw is highly recommended. This is a great idea that we reckon should be rolled directly into OS X.



App Store » iOS APPS

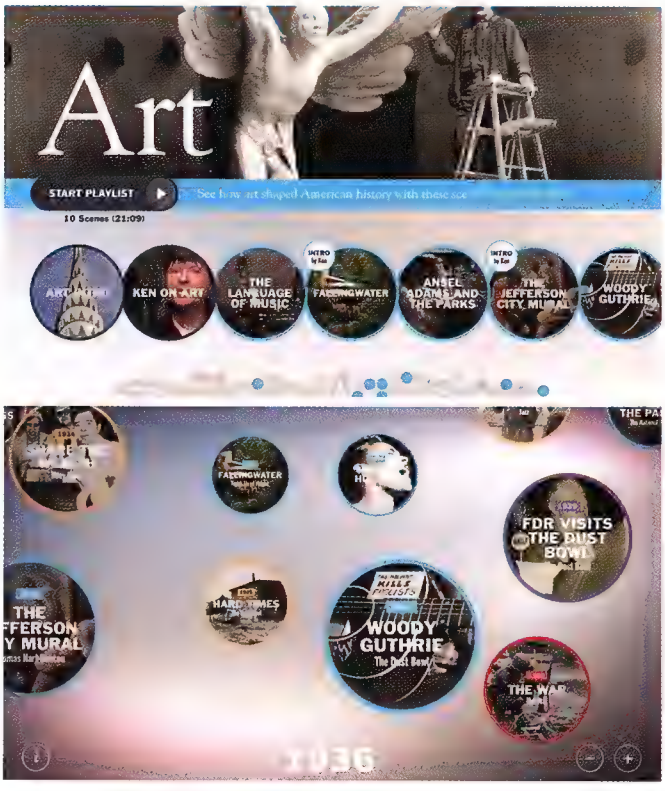
Ken Burns

Before the effect came the filmmaker.

FREE | KEN BURNS MEDIA | TINYURL.COM/KKLN9LW

Decades of fascinating and enlightening documentary work by filmmaker Ken Burns form the core of his self-titled app, which draws on close to four hours of footage compiled from documentaries covering a huge breadth of material relating to American history.

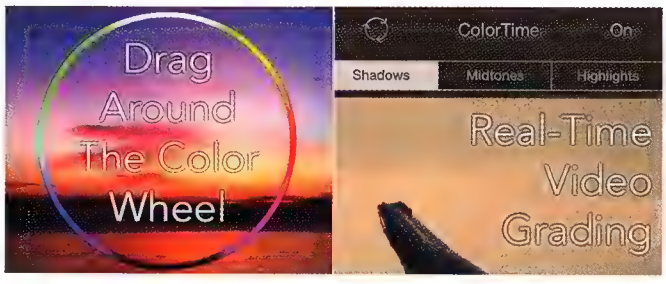
Only the 31-minute Innovation playlist is available free, though; the rest requires a $12.99 in-app purchase. While we'd have liked to have longer clips included, careful, almost meticulous design and curation underpins everything. This could have easily been a lazy ad for Burns' films, but there's a clear attempt to make the clipped stories stand on their own. He tells human stories, which are relatable and moving, and the app gets across much of the who, how, and why of big moments in US history. For those interested in 20th Century history or documentary filmmaking, Burns' storytelling mastery shines through in this official app.



iTranslate Voice 2

$2.99 | SONICO | TINYURL.COM/MORK7B3

iTranslate Voice 2 is a total reinvention of Sonico's audio translation app, rewritten for iOS 7 and adding iPad support. Offline voices feature for the first time (thanks to iOS 7's new accessibility features), with faster spoken results for 26 of the app's 42 languages — though you still need an internet connection for the actual translation process. The AirTranslate feature takes advantage of the peer-to-peer wireless iOS 7 technology used in AirDrop, making for easier cross-language conversations. Translated text is shown on-screen as well as spoken, and results with Russian and Ukrainian speakers were fast, with a high degree of accuracy, but text can be edited if the voice recognition isn't quite perfect. Tapping a translation lets you repeat audio playback, copy text or share, but there's no way to archive whole conversations. Still, it's a pretty impressive feat all round. It exploits iOS 7 in very meaningful ways, and the native iPad support is welcome.



ColorTime 2.0

FREE | PHOTOGRAPHICA LIMITED | TINYURL.COM/LNDQ42P

ColorTime 2.0 lets you manipulate the colour casts of photos and videos using a gesture-based interface, deftly handling even 1080p HD video in real time. The free app allows up to five HD video exports, with a $6.49 IAP removing that restriction. Across the top of the screen are controls for different ways you can tweak the image, then it's just a case of dragging a finger. It's simple, and the results are quite remarkable when you play around. There are one-tap undo, redo, and reset options for a limitless, non-destructive playground of hues, which can be applied to an entire image or by painting them in with different brushes. You can sync up to five grades across devices using iCloud, though we wish you could have more. The playback options are also a bit limited — you can only play at normal speed. Proper controls would be great, but all up ColorTime is a powerful and impressive tool for colour-grading photos or video in real time.

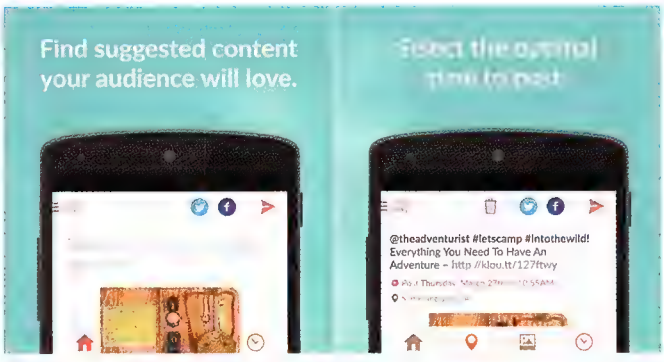
Half-Life 2

The best game ever hits Android. Kinda.

$10.99 | NVIDIA TEGRA PARTNERS | TINYURL.COM/MOD5E7D

We almost can't believe it, but it's true: Valve's pioneering classic first-person shooter, *Half-Life 2*, along with its stablemate, the excellent physics puzzler *Portal*, are both now available on Android. Yes, Android. If you missed *Half-Life 2* the first time around – the game turns ten this year – it's hard to understate the impact the game had on its release: the adrenalin-charged sci-fi adventure broke ground in atmospheric, immersive first-person gameplay, and helped establish the tentpole trend we still see today in releases like *Titanfall*, where game launches are treated as significant cultural events in their own right. There's only one catch, and sadly it's a biggie.

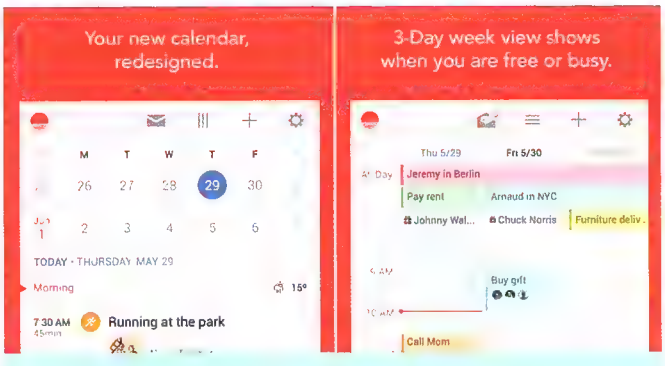
The versions of *Half-Life 2* and *Portal* currently for sale on Google Play only work with the Nvidia Shield, the graphics company's Android-based handheld gaming device; they won't run on your Android smartphone or tablet... yet. Of course, the hoped-for silver lining is that the exclusivity of these ports is only a limited time deal – in which case we could see a wider release, perhaps in a few months, although nothing has been confirmed, with both Nvidia and Valve keeping mum on their future plans for the titles. Until then, for the rest of you, both games are of course available on the desktop via Steam for similarly low prices to what they're fetching on Google Play, and as thrilled as we are at the notion of being able to play these classic titles on the go, at the end of the day their immersive nature is still best experienced on a full-size, high-res display.


Find suggested content your audience will love.
@theadventurist #letscamp #Intothewild! Everything You Need To Have An Adventure – http://klou.tt/127ftwy

Klout

FREE | KLOUT | TINYURL.COM/KDTHPUC

Klout made a name for itself a couple of years back as a rather polarising service that tied into your various social networks, gauged your 'social influence' based on your number of friends and followers — plus the level of your networking activity — then proceeded to award you a numerical score rating how influential you were. Kind of like a popularity contest, judged by robots. Klout has since relaunched with a slightly altered focus: a purported social media masterclass, to make users — basically anyone, but also including professionals like media types, marketers and entertainers — into better social creators, curators and sharers. But how? Well, the newly released Android app recommends share-worthy items it believes will resonate with your audience, throws on some content exploration tools, and lets you schedule your updates. The rest is up to you.



Sunrise

FREE | SUNRISE ATELIER | TINYURL.COM/P5CDZ45

On the hunt for a new calendar app? Look no further. Sunrise, the much-admired iOS app, has just made its way to Android. It syncs with Google Calendar and iCloud (with Exchange support coming), but the most useful element from our testing is the interface, which seamlessly flicks between a split-screen view showcasing your upcoming fortnight and an appointments list, or a three-day view highlighting days in greater detail. Coupled with a new web app for desktop access and an included Android widget, there's a lot to like here.

Windows Store » WIN PHONE 8

Time of My Life

Like sands through the hourglass...

FREE | FLIPBOARD | TINYURL.COM/MOXM8PV

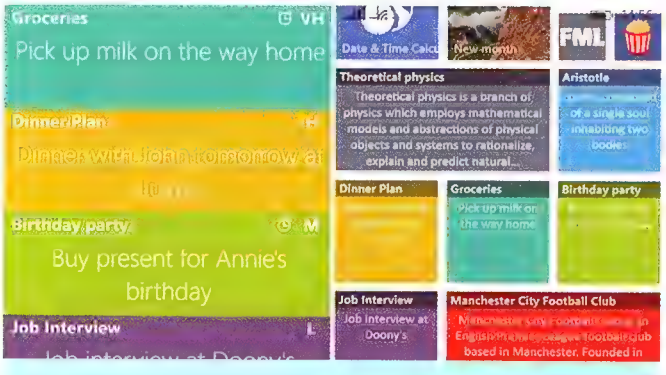
Why are we so fascinated by the notion of the 'quantified self'? The concept, if you're not familiar with it, is that technology now enables us to record and analyse in virtually microscopic detail the data that makes up our lives. Not data meaning the digital content on our devices, mind you, but rather the measurements of our real-world existence, from the number of steps we take on any given day, to the distances we travel in doing so; the amount of time spent sleeping or at rest, versus the hours engaged at work.

Whatever the reason, interest in the life-logging movement has exploded in the past few years, with smartphone sensors providing the perfect tools for monitoring ourselves and our movements (or lack thereof). Time of My Life, developed by Microsoft Research, lets Windows Phone users get in on the game, with the simple goal of showing you how you spend most of your time so you can understand – perhaps – how to spend it better. The app will need to track you for a while before it shows any pertinent location data, and it could probably do with an expanded feature set, but the biggest drawback currently is the mapping itself – which doesn't default to your current location as you might expect, but rather continually starts back at Microsoft HQ in Redmond, Washington! That setting must be very helpful for keen life-loggers in the Microsoft Research team, but less so for the rest of us...

WhatsApp

FREE | WHATSAPP | TINYURL.COM/QBWK74E

Popular messaging app WhatsApp recently got pulled from the Windows Phone Store after a notifications glitch prevented it from working with a recent update to the WP8 OS. It took the joint efforts of Microsoft and the WhatsApp team to get the app back on track, bringing with it some new features including chat backgrounds, privacy controls and custom notification tones. If you haven't used it before, WhatsApp is a brilliant SMS replacement tool that enables you to send 'free' text messages (and more) to other WhatsApp users, via data. The service is free for the first year and only costs US$1 thereafter. The app works seamlessly with your phone's built-in contacts list and your own phone number, meaning setup's a breeze — short of convincing any holdout friends to join the service, but WhatsApp is already so prevalent we think you'll be pleasantly surprised.



Sticky Notes HD

FREE | THOMAS TSOPANAKIS | TINYURL.COM/JWFVWKT

On the surface Sticky Notes HD might resemble a simple notes app, but take a peek under the hood and you'll find an altogether more powerful beast. In addition to scribbling down to-dos, phone numbers or potential chat-up lines, you can colour code your notes, organise them by priority, set reminders, lay them over images from your camera roll, share to other apps, pin to the start screen or lock screen and more. There are all sorts of aesthetic controls too, including font, text colour, font size and alignment, and the ability to password-protect to boot. Brilliant.

Why manage barriers...

...when you can shatter them.
The original OCZ Vector Series broke new ground...
But it's our next generation Vector 150 Series that shatters today's SSD barriers. If you are like most power users, you believe sustained storage performance and endurance are essential to your computing experience. Vector 150 SSDs not only start off fast, but stay fast. They not only manage endurance limitations, but overcome them. When other SSDs fall short, Vector 150 delivers. If you want lasting reliability and performance, here it is.
OCZ STORAGE SOLUTIONS
A Toshiba Group Company
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The smart choice in SSDs

Samsung's EVO family of solid-state drives offer the most compelling mix of performance, price and capacity on the market.

SSDs have transitioned from niche products made for enthusiasts and professionals to something that every PC should have. As SSDs have aptly proved, traditional platter-based hard drives can be a huge bottleneck when it comes to performance, with today's SSDs offering up to five times the speed when it comes to reading and writing data — and many times that in more seek-intensive tasks, like the random reads and writes that make up most of our day-to-day computing tasks. In short, if you want a computer that not only boots up and loads apps quickly, but is also incredibly responsive, then an SSD upgrade is a must.

So which SSDs are the best-value proposition in today's market? There's a lot of competition from SSD makers (both big and small), but of all those, Samsung's EVO line of drives has the most persuasive range of products. If you need a big SSD, Samsung's EVO range features the largest consumer drives available, with models ranging up to a whopping 1TB.

Feeling the need for speed? The EVOs consistently perform on-par with — and often better than — more-expensive drives from other SSD manufacturers. And that potent mix of capacity and speed isn't going to cost you an arm and a leg either — the EVOs are some of the best-value SSDs available and they can be scooped up for less than $1 a gig.

EVO drives also include exclusive technologies, such as Samsung's Magician software, which can make it easy to transition your PC or laptop from your old drive to your new EVO SSD. Magician also includes the innovative RAPID Mode, which detects frequently-used data and caches it to DRAM. This not only helps improve performance, but can reduce wear and tear on the SSD itself.

Samsung is an undisputed expert when it comes to flash storage. Its chips don't just end up in its own devices (including its popular Galaxy smartphones), but even in products from its major competitors. It's this level of integration that helps Samsung put together the most compelling SSDs currently available. Whether you're looking for an inexpensive way to upgrade your laptop's hard drive to turn it into a lightning-fast portable PC, or putting together the plans to build your next killer gaming rig, Samsung's EVO line up is the smart choice when it comes to SSDs.

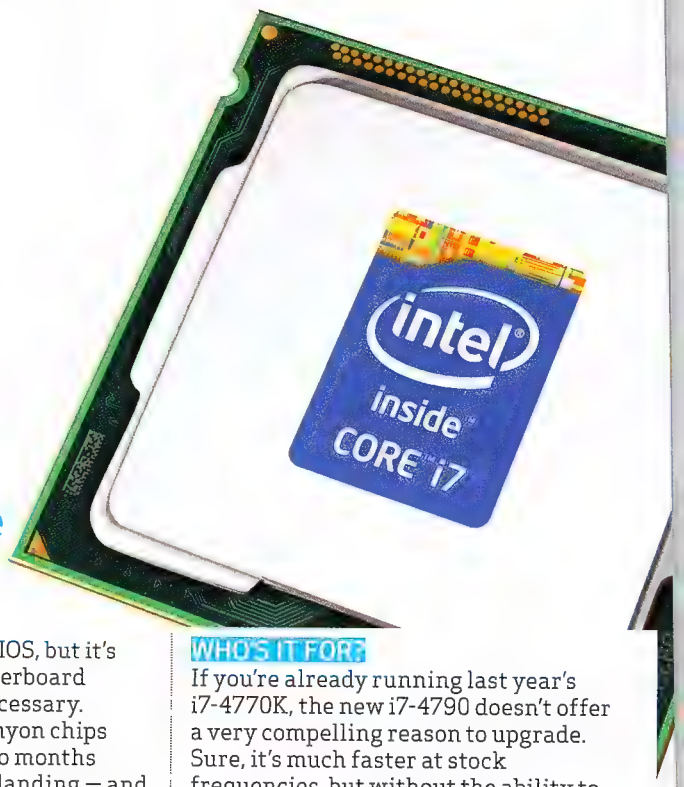
The 840 EVO at a glance

Capacity
Up to 1TB (1TB = 1 trillion bytes)
Form Factor
2.5-inch
Interface
SATA 6Gb/s (Compatible with SATA 3Gb/s & SATA 1.5Gb/s)
Dimension (WxHxD)
100 x 69.85 x 6.80mm
Weight
Max 53g
Storage Memory
Samsung 19 nm Toggle DDR 2.0 NAND Flash Memory
Controller
Samsung 3-core MEX Controller
Cache Memory
Samsung 1GB Low Power DDR2 SDRAM
Application
Desktop PC & Laptop PC

SAMSUNG
Samsung
Super-speed
Drive
SAMSUNG
Solid State Drive
Samsung SSD 840 PRO with RAPID mode technology
Samsung's fastest and most powerful SSD range yet with RAPID mode technology. A distinguished level of Samsung performance available to anyone. Visit www.samsung.com/ssd for more information

Z97 and Devil's Canyon on test

Intel's 2014 desktop gear is finally here, but is it worth updating to? Lindsay Handmer tests two new CPUs and all the major flagship motherboards to find out.



It's a somewhat frustrating time to be considering upgrading your PC. Motherboards based on Intel's new Z97 and H97 chipsets are already out and offer some new features, but the range of new Devil's Canyon CPUs to go along with them is patchy. And then there's the big question that desktop PC enthusiasts have had to ask for the last few years: is this even a generation of gear worth buying into? The Intel 9-series chipset is another comparatively minor update over last year's 8-series, offering a few small (but potentially key) upgrades. The latest Z97 motherboards work to overcome the speed limitations currently facing the fastest SSDs, adding in SATA Express to give SSDs access to 1GB/s of bandwidth – a big gain over the roughly 600MB/s currently available via SATA 6Gbps. The M.2 specification (formally known as the 'Next Generation Form Factor') gives internally-mounted, card style SSDs access to these higher speeds. Smaller than the mSATA specification it replaces, M.2 lets you install compact high speed SSDs similar to what's used in many of today's laptops. The Z97 chipset also offers better management for hybrid hard drives, where a small SSD cache improves performance on a larger mechanical hard drive.

MORE POWER?

On the downside, when using even new Devil's Canyon CPUs, Z97 doesn't exactly give a huge need to upgrade. While Intel has little competition from AMD in the performance CPU category, Devil's Canyon boils down to being a refresh of 2013's Haswell architecture. And in fact, while Intel originally stated that the new CPUs would not work on anything but the latest 9-series chipsets, they will actually run just fine on existing Z87 and H87 motherboards, somewhat negating the need for a full upgrade if all you want is a bump in CPU power. It is worth checking with your manufacturer before shelling out for a new CPU and expect to upgrade your BIOS, but it's good to know that a motherboard upgrade is not strictly necessary.

Considering Devil's Canyon chips have launched almost two months after Z97 boards started landing – and the latter will work fine with last year's CPUs – are they even worth considering for prospective upgraders? The answer is, somewhat surprisingly, 'yes' – and in more than one scenario.

The new flagship Core i7-4790K offers a base clock speed of 4GHz – the first mainstream chip from Intel to hit this speed – and can boost to 4.4GHz. That's actually a considerable jump over its predecessor, the i7-4770K, which runs at 3.5GHz and boosts to 3.9GHz. The secret here is cooling – Haswell CPUs generally run hot when overclocked. While the Devil's Canyon refresh doesn't offer an increase in thermal efficiency, to help with issues of overheating at very high clock speeds Intel has instead upgraded the thermal interface material between the actual CPU and the metal heat spreader we see on the outside. The new CPUs use what Intel calls the 'Next Generation Polymer Thermal Interface Material' (NGPTIM) to help keep heat transfer high and CPU temperatures as low as possible. There are also more capacitors to give smoother power delivery at high current draws. This is great news for overclockers who should be able to push the new Devil's Canyon CPUs much further than Haswell. For those less interested in testing the limits, however, Devil's Canyon is really just a speed boost to existing CPUs, which will roll out across a range of new models including Core i3 and i5 CPUs. It's also worth noting that the integrated Intel HD Graphics 4600 GPU stays the same in the new processors.

Devil's Canyon is a decent little refresh then, but it's hardly a game changer. At the time we went to print, the i7-4790K wasn't yet available, though its non-overclockable sibling, the i7-4790, was easy to find. We tested the latter chip, alongside the Core i5-4690, to see how they compare.

WHO'S IT FOR?

If you're already running last year's i7-4770K, the new i7-4790 doesn't offer a very compelling reason to upgrade. Sure, it's much faster at stock frequencies, but without the ability to overclock, it's easy to get similar performance from your i7-4770K with a little effort. Of course if you're building a new PC and don't plan to overclock, the i7-4790 is the better choice – costing the same as the i7-4770K yet offering improved performance straight out of the box. We'd still consider the K variant a must have if you're a ravenous overclocker, but at the time of writing no pricing was available. If you plan to game, the new Core i5-4690 costs $100 less than the older i7-4770 yet shares the same clock speeds. In our benchmarks it gave performance that was only marginally slower in general system benchmarks and matched the non-overclocked 4770K's results for gaming. It's therefore a no-brainer.

COMING UP

If we look beyond the Haswell and Devil's Canyon chips currently available, there are other new CPUs in the pipeline. Broadwell is Intel's next big release, based on a 14 nanometer die shrink of the existing Haswell architecture – the next 'tock' in the company's tick-tock development cycle. Broadwell will offer significant efficiency gains, which is especially important for low-power devices like tablets and laptops. The first Broadwell CPUs are due out late in 2014, but so far that's only looking to be the mobile models that'll be wedged inside new tablets and ultrabooks.

For the quad-core chips designed for desktop use, we'll need to wait a fair bit longer; the desktop edition Broadwell CPUs aren't expected until Q2 2015. The new Broadwell CPUs will however work in existing 9-series motherboards (though not in the 8-series) by using the LGA1150 socket, so if you upgrade to a new board now, the door is at least open to a CPU bump next year.

Benchmarking

To test the motherboards we used 32GB of 1800MHz Corsair RAM, an Intel 256GB SSD, GeForce GTX 760 graphics card and a Cooler Master CPU cooler. We only got our hands on the new Devil's Canyon CPUs late in our testing cycle, so all the Z97 boards were benchmarked using our existing Core i7-4770K CPU. When testing overclocking, we let the motherboards automatic settings push the CPUs and adjust the voltages as far as possible, then stress tested to ensure the overclock was stable.

MIXED RESULTS

So getting back to our key questions, is the new Z97 chipset worth the upgrade, and if you do, should you drop in a Devil's Canyon CPU? In many ways this is a surprisingly solid update given how little change in the actual silicon and features are involved. Depending on what you're currently running though, it could still be a waste of money. If you're an avid overclocker striving for the best performance, then a premium Z97 motherboard coupled with a Devil's Canyon Core i7-4790K is arguably well worth the cost for the improved cooling. Since you'll probably also be considering an upgrade to Broadwell next year, then buying a premium Z97 motherboard now will mean you will still have access to all the latest technology in the future.

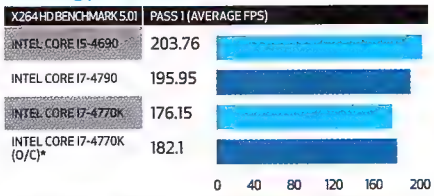
If you have an existing 8-series motherboard, then the Devil's Canyon CPUs don't offer much of a reason to upgrade. You'll need a new motherboard for Broadwell anyway, so holding off is the wiser choice. That said, your 8-series motherboard will support the Devil's Canyon CPUs, so if you've got a slower CPU and crave more processor grunt, Devil's Canyon can provide it.

If you have an older gaming PC – something running Sandy Bridge or Ivy Bridge parts – then upgrading to a Z97 (or H97) motherboard now combined with an affordable Devil's Canyon CPU such as the i5-4690 will deliver some good feature upgrades – more USB 3.0 and SATA 6Gbps ports in particular, plus the option of a SATA Express SSD for your main drive. Plus, it gives an upgrade path to a newer, faster Broadwell CPU further down the track.

Overall, from a desktop user's perspective, it's hard not to be a little underwhelmed by Devil's Canyon and Z97, but in the right circumstances it can provide a worthy upgrade. If you've already got a Haswell system, however, we'd hold off until Broadwell arrives next year.

Devil's canyon test results

Encoding performance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PASS 1 (AVERAGE FPS)
INTEL CORE I5-4690 203.76
INTEL CORE I7-4790 195.95
INTEL CORE I7-4770K 176.15
INTEL CORE I7-4770K (O/C)* 182.1
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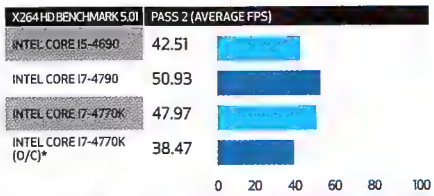
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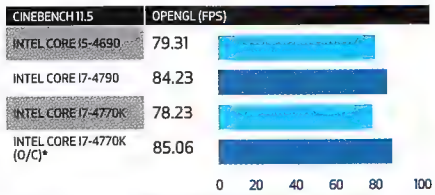
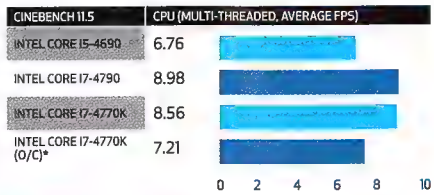
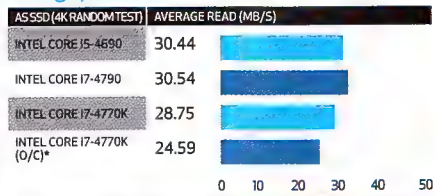



CINEBENCH 11.5
CPU (MULTI-THREADED, AVERAGE FPS)
INTEL CORE I5-4690 6.76
INTEL CORE I7-4790 8.98
INTEL CORE I7-4770K 8.56
INTEL CORE I7-4770K (O/C)* 7.21
0 2 4 6 8 10

Storage performance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AVERAGE READ (MB/S)
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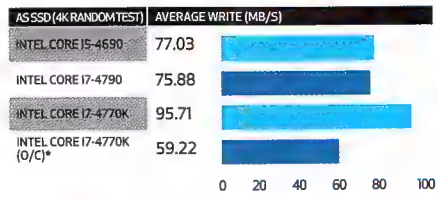
INTEL CORE I7-4770K (O/C)* 24.59
0 10 20 30 40 50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AVERAGE WRITE (MB/S)
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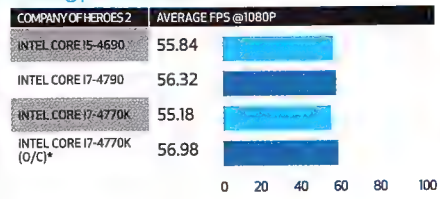
Gaming performance


COMPANY OF HEROES 2
AVERAGE FPS @1080P
INTEL CORE I5-4690 55.84
INTEL CORE I7-4790 56.32
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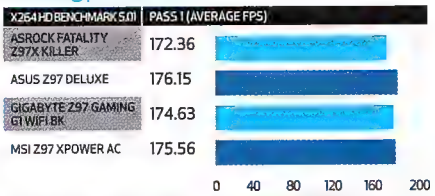
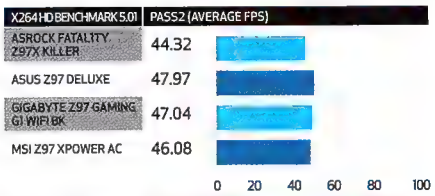
z97 motherboard test results

Encoding performance


X264 HD BENCHMARK 5.01
PASS 1 (AVERAGE FPS)
ASROCK FATALITY Z97X KILLER 172.36
ASUS Z97 DELUXE 176.15
GIGABYTE Z97 GAMING G1 WIFI BK 174.63
MSI Z97 XPOWER AC 175.56
0 40 80 120 160 200


X264 HD BENCHMARK 5.01
PASS 2 (AVERAGE FPS)
ASROCK FATALITY Z97X KILLER 44.32
ASUS Z97 DELUXE 47.97
GIGABYTE Z97 GAMING G1 WIFI BK 47.04
MSI Z97 XPOWER AC 46.08
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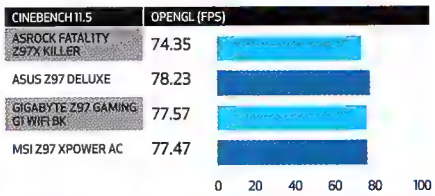
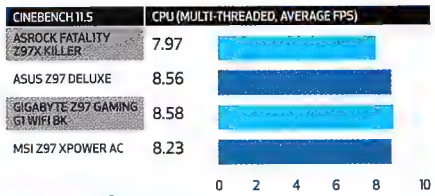
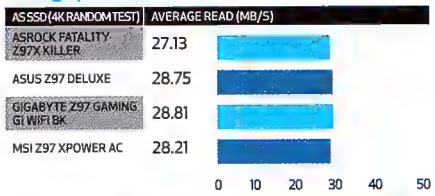
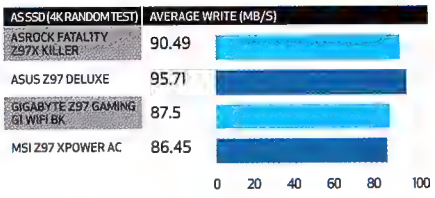

CINEBENCH 11.5
OPENGL (FPS)
ASROCK FATALITY Z97X KILLER 74.35
ASUS Z97 DELUXE 78.23
GIGABYTE Z97 GAMING G1 WIFI BK 77.57
MSI Z97 XPOWER AC 77.47
0 20 40 60 80 100


CINEBENCH 11.5
CPU (MULTI-THREADED, AVERAGE FPS)
ASROCK FATALITY Z97X KILLER 7.97
ASUS Z97 DELUXE 8.56
GIGABYTE Z97 GAMING G1 WIFI BK 8.58
MSI Z97 XPOWER AC 8.23
0 2 4 6 8 10

Storage performance


AS SSD (4K RANDOM TEST)
AVERAGE READ (MB/S)
ASROCK FATALITY Z97X KILLER 27.13
ASUS Z97 DELUXE 28.75
GIGABYTE Z97 GAMING G1 WIFI BK 28.81
MSI Z97 XPOWER AC 28.21
0 10 20 30 40 50


AS SSD (4K RANDOM TEST)
AVERAGE WRITE (MB/S)
ASROCK FATALITY Z97X KILLER 90.49
ASUS Z97 DELUXE 95.71
GIGABYTE Z97 GAMING G1 WIFI BK 87.5
MSI Z97 XPOWER AC 86.45
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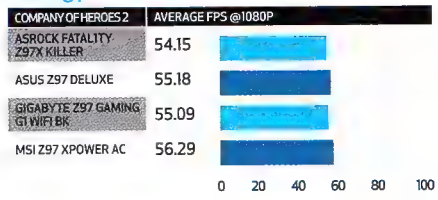
Gaming performance


COMPANY OF HEROES 2
AVERAGE FPS @1080P
ASROCK FATALITY Z97X KILLER 54.15
ASUS Z97 DELUXE 55.18
GIGABYTE Z97 GAMING G1 WIFI BK 55.09
MSI Z97 XPOWER AC 56.29
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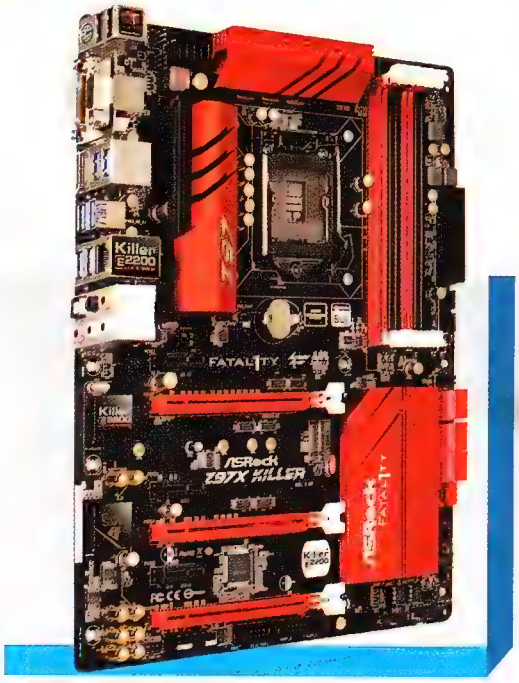


$219 | WWW.ASROCK.COM

ASRock Fatal1ty Z97X Killer

Premium performance without the excessive price tag

Hanging onto the aging Fatal1ty name, ASRock has built a gamer focused motherboard that won't blow the budget. To keep prices low, ASRock doesn't include extras such as Wi-Fi, Bluetooth or Thunderbolt ports, though does have both SATA Express and M.2 compatibility.

During testing the ASRock is only slightly slower in most benhcmarks compared to the more expensive boards, though it did give the highest max frame rate on *Company of Heroes 2* and some great 4K random write speeds.

Of course when you consider that it costs half what the other boards do, it actually offers excellent performance for your dollar. It does lack some of the fancier features the other boards enjoy, but it's not a bad trade off.

Unlike the other boards, the ASRock is not really aimed at those who want to open air overclock on a table – rather it's destined for more modest but still powerful gaming desktops. Rather than the auto overclock feature other motherboards offer, the ASRock has preloaded profiles – in our case 4.4GHz was stable though the manually adjustable options were quite complex to use.

The ASRock supports up to 32GB of DDR3 RAM overclocked to 3,200MHz. It has three PCIe 3.0 16x slots (though runs x8x4x4 with three videocards), three PCIe 2.0 x1 slots and six SATA connectors.

Round the back end you get 6 USB 3.0 ports, 2 USB 2.0 ports, Killer NIC Gigabit LAN, DVI, HDMI, VGA, S/PDIF, 5x 3.5mm audio jacks and a legacy PS2 port.

Verdict

Good performance if you can do without some premium extras.

★★★½☆

$499 | WWW.ASUS.COM.AU

ASUS Z97 Deluxe (NFC + WFC)

Features without compare.

Adding in every last option possible, the ASUS Z97 Deluxe is a fully featured motherboard. The key stand outs are NFC Express 2, Wireless Charging and Thunderbolt connectivity. You also get 802.11ac Wi-Fi, Bluetooth, two SATA Express ports and M.2 compatibility.

Installing a CPU and RAM in the Z97 is easy, with a well laid out board that gives good access around the CPU and has onboard power and reset buttons. The ASUS BIOS is also excellent, giving plenty of scope for automatic and manual setup. Performance is top notch across the board and the ASUS gave some of the highest benchmark results – only being beaten very slightly by Gigabyte in our CineBench CPU and AS SSD 4K random write tests. We let the ASUS Ezy Tune take over for overclocking and it easily pushed the CPU up to 4.5GHz.

The Z97 Deluxe handles up to 32GB of DDR3 that can be overclocked up to 3,300MHz. GPU junkies can run Quad SLI or three way CrossFire via the three PCIe express slots. You also get 6 SATA 6Gb/s connectors and a range of USB 3 and 2 header ports on the motherboard.

This ASUS board puts in special effort for audio, with Crystal Sound 2 (Realtek ALC1150) that has isolated PCB and an EMI shield to reduce noise. Video output is via HDMI, DisplayPort or mini DisplayPort connectors. On the rear I/O panel the Z97 has 6 USB 3.0 ports, another 4 USB 2.0 ports, dual Gigabit LAN, S/PDIF and 6x 3.5mm audio jacks.

Verdict

A lofty price, but excellent performance and oodles of extras.

★★★½☆

$479 | WWW.GIGABYTE.COM

Gigabyte Z97 Gaming G1 WiFi BK

Individually stressed tested for 168 hours before shipment.

An enthusiast focused premium board, it supports up to 32GB of DDR3 overclocked to 3,200MHz. You also get dual PCIe slots running at 16x, another 2 running at 8x and another three PCI Express x1 slots. The board layout and CPU clearance is a touch tighter than we would like, though installation is straightforward. For overclocking enthusiasts, the onboard VRM heatsinks have built in water cooling ports. You also get an onboard power and reset button and a 2 digit LED POST code readout. The Gigabyte board performed well in our testing and pushing our CPU to 4.5GHz was straightforward with the automatic Smart Quick Boost option. The BIOS is also excellent has plenty of scope for overclocking.

The board features Killer E2200 Gigabit networking as well as a separate Intel Gigabit LAN port. You also get 802.11 ac Dual Band Wi-Fi and Bluetooth v4.0. Supporting both 4 way CrossFire and 4 way SLI, the motherboard has flexibility for hardcore gaming. The audio section of the board is electromagnetically isolated with an interchangeable op-amp. Audio output is via five 3.5mm jacks or optical S/PDIF.

If you plan on using the Intel graphics, you get an HDMI port, DVI and DisplayPort. You also get 6x SATA 6Gb/s with support for RAID, plus another four Marvel-powered SATA connectors. While the Gigabyte board has SATA Express, it doesn't have M.2. USB abounds, with 6 USB 3.0 ports, and 2 USB 2.0 ports, plus another 2 and 6 ports respectively available via motherboard headers.

Verdict

A decent enthusiast board, but it's missing a few premium features considering the price.

★★★☆☆

$535 | WWW.MSI.COM

MSI Z97 XPower AC

Aimed at hardcore overclockers.

For those who don't plan to do any overclocking, this MSI board is not for you. Importantly the board features a very open socket design for larger coolers as well as keeping the area around the socket bare enough for easy installation of insulation.

You also get water cooling ports on the motherboard heatsinks and extra voltage read out points. If you go to the extreme of removing your CPUs integrated heat spreader, the MSI board has support for delidded CPUs and an extra fan support mount for out of case use.

It also has power, reset and real time base clock adjustment buttons. The MSI Click BIOS 4 is easy to use with a nicely laid out interface that supports mouse control. Benchmark results were excellent, though the XPower was never quite the fastest. While we didn't extremely overclock, MSI's built in OC Genie happily pushed our CPU to a stable 4.5GHz.

The XPower supports overclocked DDR3 up to 3,300MHz and both SATA Express and M.2 SSDs. The PCIe configuration supports four-way SLI and CrossFire, and will bypass the PLX chip for lower latencies if you're using just a single card.

Round the back you get the usual array of connectivity – eight USB 3.0 ports and two USB 2.0, Gigabit LAN, S/PDIF, six 3.5mm audio jacks, HDMI, DisplayPort and even a legacy PS/2 port. The Wi-Fi is dual band 802.11ac, plus you get two antennas and Bluetooth 4.0.

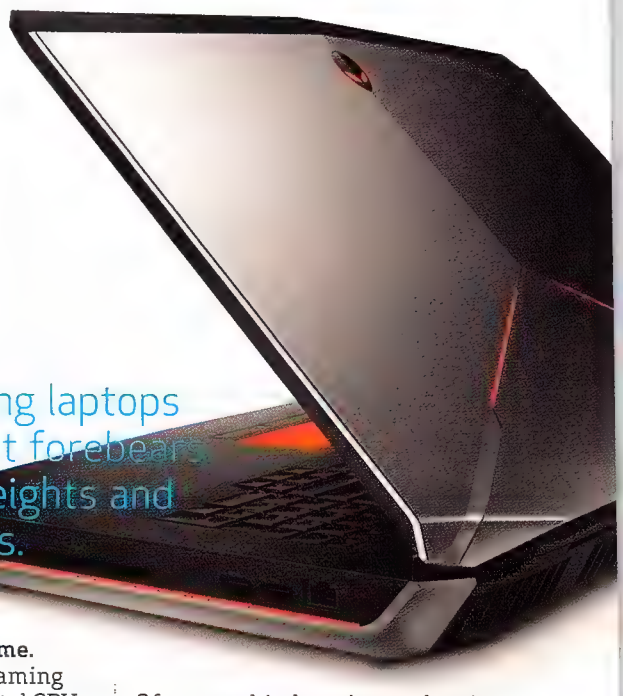
The MSI Z97 is a very expensive motherboard, but if you plan to push your new (or old) CPU to its limits, you won't find better.

Verdict

Worth a second look for overclocking enthusiasts.

★★★★☆

Next-gen gaming laptops



Slimmed down and sped up, the latest gaming laptops have little in common with their heavyweight forebears. Lindsay Handmer tests eight new featherweights and pits them against four traditional behemoths.

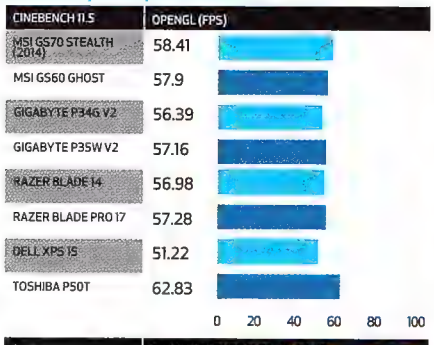
As hardware has shrunk and become more power efficient, the latest trend for gaming laptops is ultra-thin and light. Now in their second generation, performance is improving while prices are dropping. Your thick gaming behemoth still has its place, offering the highest performance and best bang for buck, but the new thin models brings fresh appeal to gaming laptops. With improved portability gaming laptops are no longer just luggable – they can be slipped in a bag and pulled out wherever or whenever you have time to game.

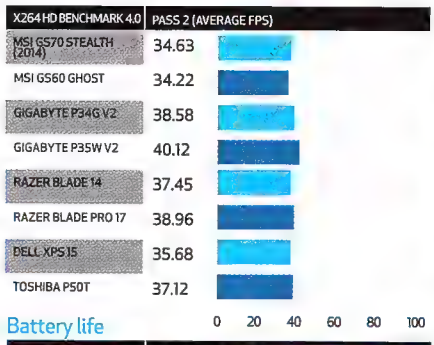
Notably almost all the thin gaming laptops use Nvidia GPUs and Intel CPUs. While not all models have the very latest power sipping GeForce 800 series videocards, even the previous 700 series offers efficient operation. While 802.11n and Bluetooth v4.0 is widespread, keep an eye out for the newer 802.11ac dual band Wi-Fi.

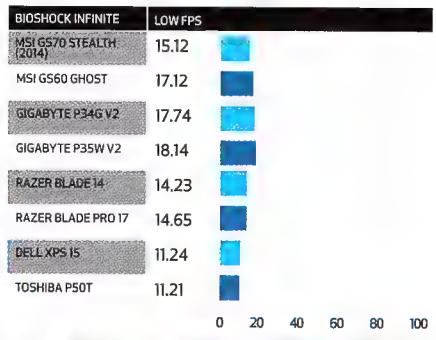
Designed to be taken on the go, thin gaming laptops often have fairly large batteries, giving long run times off grid. Of course this doesn't translate into huge gaming times when unplugged but you can generally expect at least an hour. NVIDIA is actively working to improve this figure and the latest 800M GPUs feature a Battery Boost mode. Limiting the frame rate to a user selectable value and dynamically regulating GPU performance, Battery Boost can double your on battery gaming session for certain games. Your

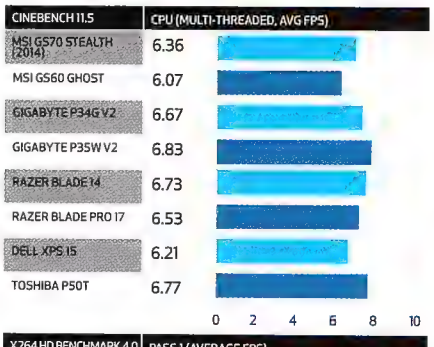
Thin & light gaming laptops

General system performance

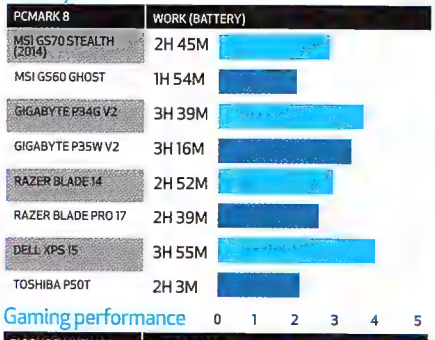


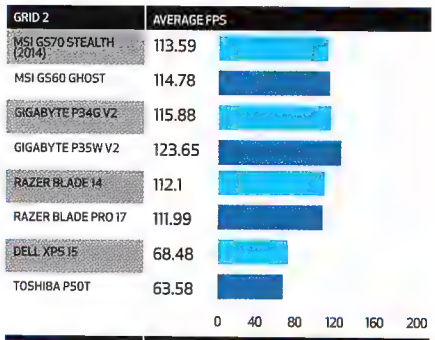

X264 HD BENCHMARK 4.0
PASS 2 (AVERAGE FPS)
MSI GS70 STEALTH (2014) 34.63
MSI GS60 GHOST 34.22
GIGABYTE P34G V2 38.58
GIGABYTE P35W V2 40.12
RAZER BLADE 14 37.45
RAZER BLADE PRO 17 38.96
DELL XPS 15 35.68
TOSHIBA P50T 37.12
0 20 40 60 80 100



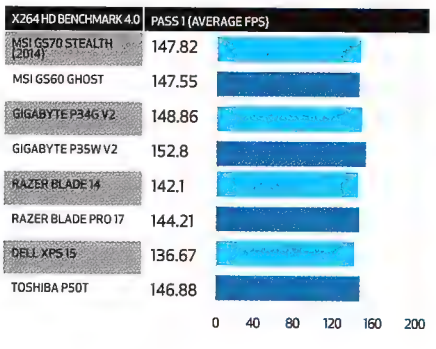

CINEBENCH 11.5
CPU (MULTI-THREADED, AVG FPS)
MSI GS70 STEALTH (2014) 6.36
MSI GS60 GHOST 6.07
GIGABYTE P34G V2 6.67
GIGABYTE P35W V2 6.83
RAZER BLADE 14 6.73
RAZER BLADE PRO 17 6.53
DELL XPS 15 6.21
TOSHIBA P50T 6.77
0 2 4 6 8 10

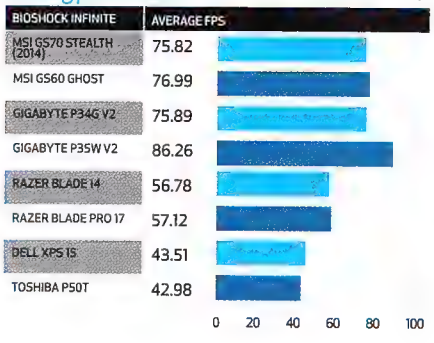
Battery life

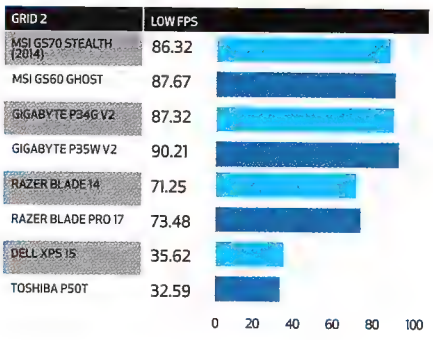

PCMARK 8
WORK (BATTERY)
MSI GS70 STEALTH (2014) 2H 45M
MSI GS60 GHOST 1H 54M
GIGABYTE P34G V2 3H 39M
GIGABYTE P35W V2 3H 16M
RAZER BLADE 14 2H 52M
RAZER BLADE PRO 17 2H 39M
DELL XPS 15 3H 55M
TOSHIBA P50T 2H 3M
0 1 2 3 4 5



Gaming performance


X264 HD BENCHMARK 4.0
PASS 1 (AVERAGE FPS)
MSI GS70 STEALTH (2014) 147.82
MSI GS60 GHOST 147.55
GIGABYTE P34G V2 148.86
GIGABYTE P35W V2 152.8
RAZER BLADE 14 142.1
RAZER BLADE PRO 17 144.21
DELL XPS 15 136.67
TOSHIBA P50T 146.88
0 40 80 120 160 200





results will vary though, and less intensive games will see much less of a benefit. While most of these thin laptops are designed with mid to high end gaming in mind, a few tackle the lower end of the market. Offering more modest looking laptops with a strong productivity focus, these models are a great compromise between getting work done and some casual gaming.

So how do these thin laptops manage to fit so much hardware into such a small package?

Fortunately most of the hardware is already pretty compact, so it's a matter of intelligently arranging it within the frame. One of the most important features is a cooling system, using heat pipes to route heat away from sensitive parts such as hard drives and batteries. The laptop frame itself needs to be rigid yet slim, so will often incorporate a lot of metal. Screens are also somewhere manufacturers can shave off a few precious millimetres, though this can leave them overly flexible. Hardware is only half the battle and software control plays a big role in keeping your thin laptop from having a meltdown. By intelligently boosting performance when needed and throttling it back wherever possible, the laptops can briefly exceed their ongoing capacity to remove heat while maintaining overall heat production under critical levels.

Still seen as a premium option rather than the standard, thin gaming laptops are more expensive than their thicker yet similar spec rivals. This isn't always a bad thing, as they generally incorporate premium features such as LED backlit keyboards, high resolutions and quality screens, high end audio and upgraded networking.

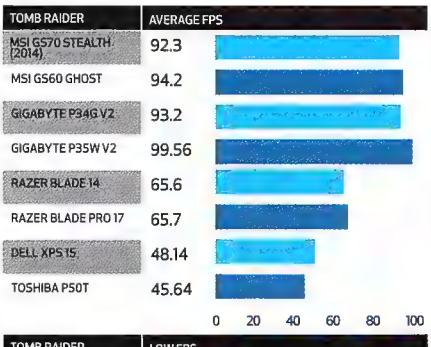
While we love the new line-up of thin and light gaming PCs, it's not without its drawbacks. One notable problem is the general lack of optical drives. While this is not a problem for many who install games from services such as Steam, it can make it hard to play your existing DVD titles. Thin gaming laptops also still produce a lot of heat, but have a smaller amount of space to house a cooling system. The result is small, high speed fans which get very noisy under load. Worse, the fans often still kick in when doing day to day tasks, instead of running silently. Thin laptops are also generally limited to the high end side of middle range hardware as they don't have the space or capacity to cool anything more powerful. Keep in mind that while thin themselves, these laptops still need big heavy power bricks to charge them.

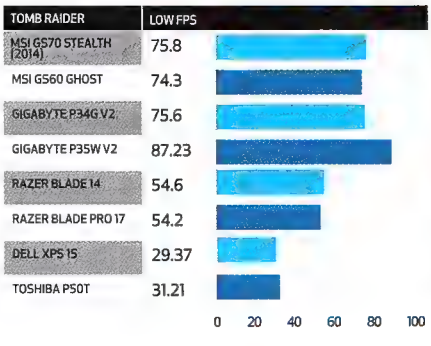
> "Fortunately most of the hardware is already pretty compact, so it's a matter of intelligently arranging it within the frame."

In contrast, your typical behemoth gaming laptop has larger, slower spinning fans. They still get noisy under heavy load, but in day to day use can run almost silently. The extra space gives more room for extras such as secondary hard drives, Blu-ray drives, better speakers and subwoofers. The larger frames can also support higher end hardware and dual videocard setups. You can also find laptops with screen sizes of 18-inches – something not available in the thin models.

A chunky frame also has more room for extra USB ports or video outputs or legacy connections such as FireWire. So far only monster gaming laptops include support for extras such as Nvidia 3D Vision.

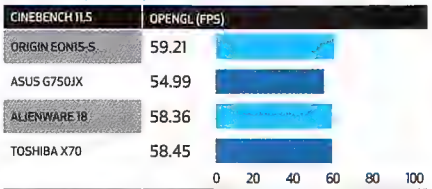
From on the go portability to a hulking powerhouse, gaming laptops have a model that will suit your needs.

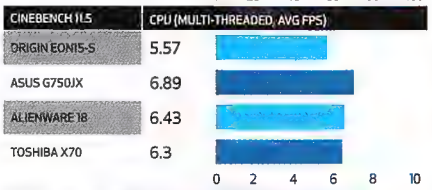


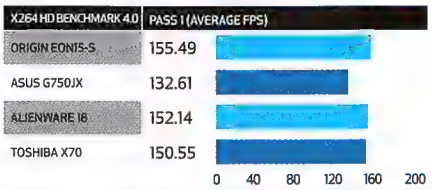


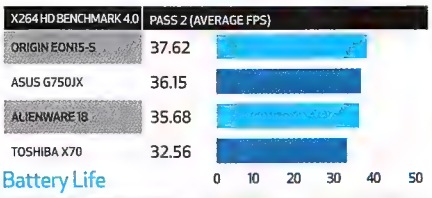
Behemoth gaming laptops

General system performance

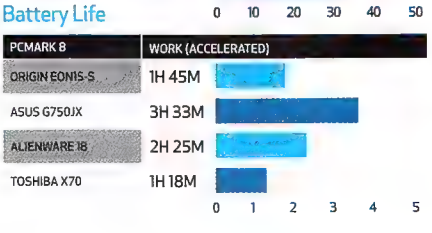




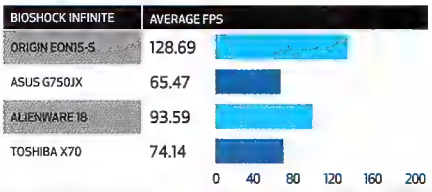


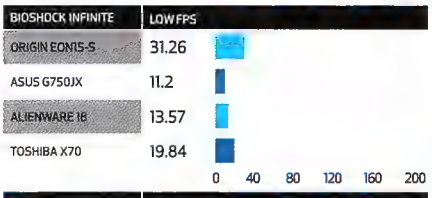


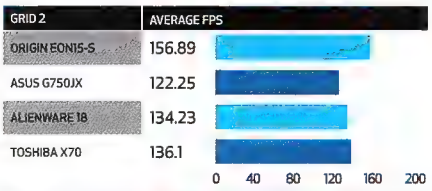
Battery Life

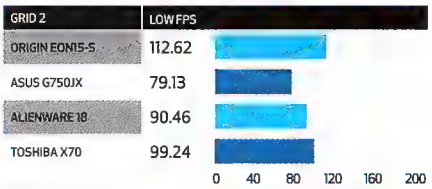


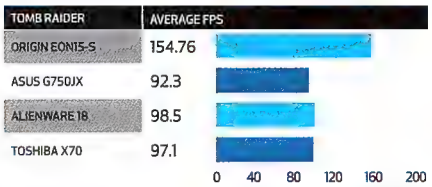
Gaming performance

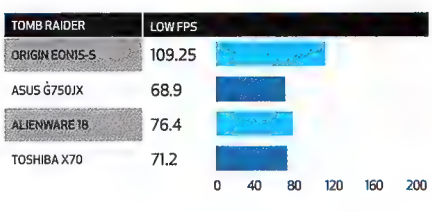












$2,999 | WWW.DELL.COM

THIN & LIGHT GAMING LAPTOPS

Dell XPS 15

A genuine MacBook Pro competitor.

Suited for casual gamers who need a portable productivity machine, the XPS 15 doesn't feature the latest GPU – instead it's got a decidedly mid-range NVIDIA GT 750M with 2GB of GDDR5 RAM. Still, as videocards go it's quite capable and will happily run your favourite games at lower settings, or let you get in a few hours on your favourite MMO. CPU wise, the XPS 15 has an Intel Core i7-4712HQ that can boost up to 3.3GHz. It's also got 16GB of RAM and a large 512GB SSD.

Built from machined aluminium and just 18mm thick the Dell is extremely portable, though it still manages to cross the 2kg barrier. On the plus side, the 15.6-inch LCD on the XPS 15 is amazing. Not only does it have touch control and a 3,200 x 1,800 resolution, it's IPS for excellent quality and accurate colour reproduction. The backlit keyboard is a little small, but extremely solid and the large trackpad is one of the best we have used.

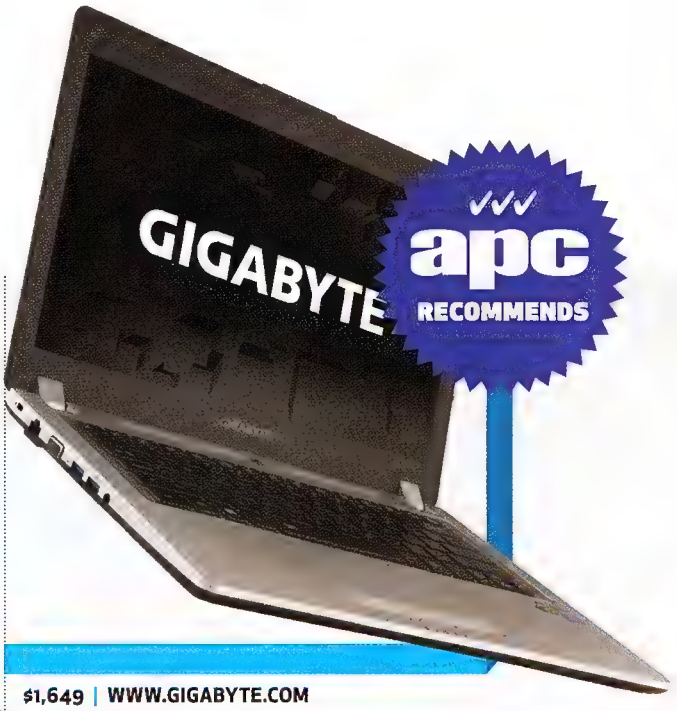
In normal use the Dell is very quiet but ask a lot from the CPU and GPU and the fans do emit a noise more akin to a roar than a whine. Thanks to a large 91 watt hour battery, you can run the Dell for 4.5 hours unplugged.

As expected, the XPS has 802.11ac Wi-Fi, Bluetooth, webcam and card reader. Down each side you get the usual 3 USB 3.0 ports (plus one USB 2.0), HDMI, mini DisplayPort and 3.5mm audio I/O jacks.

Verdict

A high-end but pricey thin laptop that can handle casual gaming.

★★★½☆



$1,649 | WWW.GIGABYTE.COM

Gigabyte P34G v2

A powerful update to a mini gaming machine.

Looking more like a non-descript Ultrabook than a gaming PC, the new version of the 14-inch P35G has high-end hardware in all the right places. Gaming prowess is provided the excellent NVIDIA GeForce 860M GPU that has 4GB of GDDR5 RAM. The Gigabyte laptop also has an Intel Core i7-4700HQ – pretty standard fare but with more than enough grunt in its 4 cores. The 14-inch screen has a 1,920 x 1,080 resolution and you also get 8GB of RAM and a 128GB SSD. The LCD boasts wide viewing angles and is very sharp, with good contrast and brightness though slightly muted colours. Gaming performance is great – the P34G beats its GTX 765 powered predecessor substantially.

The slightly smaller than usual 14-inch frame means the 20.9mm thick P35G is easily slipped in a bag or carried around. It's also lighter than most at 1.76kg. The keyboard is a little bouncy, though the auto adjusting backlight works well and the large trackpad is accurate.

In normal use you can eke out over 3 hours from the non-removable battery, though this will drop dramatically if you try and do any gaming.

The P34G has a lot of heat to move when under load and the fans can be annoyingly loud – something the small speakers cannot cover up.

The laptop comes with the usual array of 802.11ac Wi-Fi, Bluetooth, card reader and webcam. It's also got 2x USB 3.0, 2x USB 2.0, Gigabit LAN, HDMI, VGA and a single 3.5mm audio jack.

Verdict

A very affordable yet super portable gaming PC.

★★★★☆

apc RECOMMENDS

$2,149 | WWW.GIGABYTE.COM.AU

Gigabyte P35W v2

Big hardware in a small package

Fresh off the boat with a v2 refresh, the P35W now rocks a GeForce GTX 870M with a massive 6GB of GDDR5 RAM. It's not all about the GPU either, with an Intel Core i7-4710HQ CPU, 16GB of RAM and dual 128GB mSATA SSDs. The 15.6-inch screen features the usual 1,920 x 1,080 resolution but has a wide colour gamut and 170 degree viewing angle. In use it's quite good, we found the colours vibrant and deep blacks.

For secondary storage, the P35W is equipped with a 1TB 2.5-inch 5,400RPM hard drive. Important for some gamers, it even has a slimline Blu-ray drive squeezed in, though this can be swapped out for another 2.5-inch hard drive. At 20.9mm thick, the Gigabyte is one of the thinnest gaming laptops out there, yet still feels incredibly solid to use, no doubt in part due to the 2.36kg of weight.

The single GTX 870M is very capable and will easily take on the latest games with the detail settings cranked right up.

Of course, while the two rapidly spinning cooling fans keep the P35W from bursting into flame, they are not exactly easy on the ears. The inbuilt speakers do manage to drown it out, but it's a rather tinny struggle at times.

The P35W also has the standard 802.11ac Wi-Fi, Bluetooth, an auto adjusting keyboard backlight and webcam. Running down each side are 4x USB ports (2x USB 3.0), HDMI, VGA, Gigabit LAN, mini DisplayPort, a card reader and 3.5mm audio I/O jacks.

Verdict

A super slim yet affordable laptop jam-packed with hardware.

★★★★☆

$2,549 | WWW.MSI.COM

MSI GS60 Ghost

15-inches of portable gaming power.

Shaving off every last millimetre, the MSI GS60 is just 19.9mm thick – looking more like an Ultrabook than a powerful gaming laptop. Inside it has an Intel Core i7-4700HQ CPU backed up by 16GB of RAM and a 256GB SSD. Graphics grunt is provided by the capable GeForce GTX860M that has 2GB of its own GDDR5 RAM. You don't get a DVD drive, though there is a secondary 1TB hard drive to store your files. It's also got a 15.6-inch 1,920 x 1,080 LCD, and while colours seem a little muted, the overall quality is good.

Build quality is excellent, and while the thin screen flexes a fair bit, the laptop feels very solid overall. It also weighs under 2 kg, making it very portable – but be aware the power brick is on the large side. When gaming the GS60 gets quite noisy, though more annoyingly the fans become audible even when only doing lightweight tasks.

The excellent keyboard is built by Steel Series and has a colour changing LED backlight, while the trackpad is large and reasonably accurate. The inbuilt audio is useable, but not surprisingly lacks a little bass.

We would have preferred more than three USB ports, but at least they are 3.0 spec. You do get 3.5mm audio I/O, HDMI, a card reader, dual Mini DisplayPort, and Killer Gigabit LAN. The MSI also has 802.11ac Wi-Fi, Bluetooth and 1080P 30FPS webcam. For peace of mind, the GS60 comes with a MSI 2 year pick up and return warranty.

Verdict

Pricier than its 17-inch brother, but overall a very solid gaming laptop.

★★★½☆

$2,499 | WWW.MSI.COM

MSI GS70 Stealth

Clad in stylish yet understated dark brushed aluminium.

With a large 17-inch frame, the GS70 is remarkably thin and light at 21.8mm and 2.6kg. Packed flat inside the laptop is a Core i7-4700HQ CPU and GTX860M – a higher end mid-range GPU that gives a good balance between power and efficiency. You also get 16GB of RAM, a 256GB SSD and a 1TB secondary hard drive. The 17-inch 1,920 x 1,080 LCD isn't IPS, but colour reproduction is reasonable and we found the image to be clear and bright.

It's got a 5ms response time to eliminate ghosting as well as a matte coating to reduce glare. Built as an affordable but large screened gaming PC, the GS70 will happily run most modern games at the native 1080p resolution. Turning quality settings down to medium will ensure the high frame rates, but for most gamers performance is excellent.

In use the trackpad on the GS70 isn't as accurate as we would like and occasionally gives a weird inaccurate input. On the plus side the keyboard is reasonably solid and has a funky user controllable LED colour changing backlight. Connectivity is excellent, with 802.11ac Wi-Fi, 4 USB 3.0 ports, Killer LAN, HD Webcam, card reader, HDMI, dual mini Displayport and 3.5mm Audio I/O jacks.

When comparing prices make sure you check the GPU – the almost identical previous model has a GeForce GTX 765. While the 765 is still a capable GPU (and a little cheaper), the GTX860M gives an easy 30% boost in performance while using less power.

Verdict

A large screen thin gaming laptop that does not scrimp on features.

★★★★☆

$2,699 | WWW.RAZER.COM

Razer Blade

A literally blade-like laptop.

Claimed by Razer to be the thinnest gaming laptop available, the 16.8mm thick Blade is certainly the skinniest we've tested. Despite this, it still squeezes in a Core i7-4702HQ Quad Core CPU and a GeForce GTX 765M. It also comes with 8GB of RAM and a 256GB SSD, though you can upgrade to 512GB. The 14-inch screen is reasonable, but is a little let down by the 1,600 x 900 resolution. On the plus side, it means it has plenty of grunt to run your favourite games at native resolution without dropping back the detail level.

Like all thin laptops, the Blade gets noisy under a gaming load, but the innovative cooling system does a good job of venting hot air out of the screen hinge, rather than the sides. The keyboard is small, but quite usable and is fully backlit and user programmable.

Battery life is OK and you can watch a movie, but don't expect to game when away from mains power. The Blade has the usual connectivity options - 802.11n Wi-Fi, Bluetooth 4.0, 3x USB 3.0, HDMI, LAN port and 3.5mm Audio I/O.

Razer is also preparing to launch a new version of the Blade later in the year. It's 0.9mm thicker, but also packs a more powerful GeForce GTX 870M GPU.

Razer listened to its customer feedback and the new Blade has a 3,200 x 1,800 resolution, as well as touch compatibility. Keep an eye out for the new model as the current Blade should see some great discounts.

Verdict

A little pricey (for now), but thinner than all the rest.

★★★☆☆

$2,899 | WWW.RAZER.COM

Razer Blade Pro

A hulking 17-inch laptop squashed in to just 22.4mm.

Shoehorned inside the Blade Pro is a Core i7-4700HQ Quad Core CPU and a GeForce GTX 765M. You have a choice of 128GB, 256GB or a 512GB SSD, (we tested 256GB) and 8GB of DDR3 RAM. The 17.3-inch LED backlit LCD has a 1,920 x 1,080 resolution and strong colours without being over the top.

The trackpad is placed off to one side where the numpad should be – but rather than a normal grey slab, it's a 4.05-inch 800 x 480 LCD screen. Using Razer Switchblade interface, the trackpad can directly play video (such as from YouTube) or display a custom wallpaper. It's actually quite useful as secondary mini screen and really lets you personalise your laptop. There are also 10 programmable keys that each feature a tiny LCD that let you display your own dynamic icons.

Using the Pro is a great experience – it feels rock solid and the build quality is excellent. The Blade Pro is not as noisy as you might expect, but it's still a dull roar if you want to game.

Connectivity is good, with 3x USB 3.0, HDMI, LAN, 3.5mm audio I/O and a card reader. You also get the usual webcam, 802.11n Wi-Fi, Bluetooth 4.0 and a pair of surprisingly good speakers.

Like the 14-inch Blade, the Pro is getting an update soon. The new model will keep the same CPU, but get a faster GTX 860M GPU and 16GB of RAM. Keep an eye out for clearance specials.

Verdict

Great features you won't find anywhere else.

★★★½☆

$2,499 | WWW.TOSHIBA.COM.AU

Toshiba P50t-B00R

Productivity and casual gaming in one package.

Not trying to stand out from the crowd, the 15.6-inch Toshiba P50t is a solid workhorse with the capability for some decent gaming in your downtime. It has a Radeon R9 M265X GPU with 2GB of GDDR5, which gives around the same performance as the GeForce GT 750m. While the latest games will need the detail level dropped back, older or less graphically intensive titles play just fine. The P50t has the ever popular Intel Core i7-4700HQ CPU along with 16GB of DDR3 RAM. Storage is provided by a 1TB hard drive with an 8GB SSD cache to keep a little pep in the laptops step.

The 15.6-inch IGZO screen has a 3,840 x 2,160 resolution – four times that of your typical HD panel. Colours are rich and vibrant, with great contrast and very even brightness. It's also got 10 point multi touch, though it seems a shame to get fingerprints on such a pretty screen.

It's worth noting that you won't be playing many games at the native resolution of the screen and we had a few weird scaling issues as Windows tried it's best to keep things sharp. The P50t has the usual webcam, 802.11ac Wi-Fi, Bluetooth, Gigabit LAN, card reader, HDMI and VGA outputs, 4x USB 3.0 ports and 3.5mm I/O jacks.

At 27mm thick the Toshiba is still thin and light, but the extra space means room for a Blu-ray drive and a large battery – resulting in a very good 4 hour battery life.

Verdict

A very capable laptop wrapped around an amazing screen.

★★★½☆

$2,999 | WWW.ALIENWARE.COM

GAMING BEHEMOTHS

Alienware 18

Making other behemoths looks small.

Taking the concept of a desktop replacement to a new level, the 57.5mm thick aluminium and magnesium alloy clad Alienware 18 dwarfs other laptops. One of the great things about the Alienware line-up is being able to totally customise your order online, albeit at the loss of competition on price. If you go for the top level of every hardware option you will have an overclocked Core i7-4940MX CPU, 32GB of RAM, 1TB of SSD storage and dual GeForce GTX880Ms running in SLI with 16GB of video RAM. This insane PC would set you back $7,869, so instead we tested the most modest fit out available.

For $2,999 you get a still powerful Core i7-4710MQ, 16GB of RAM, an 80GB SSD and 1TB hard drive plus dual GTX 860M GPUs. If you crave a huge screen, the 18.4-inch 1,920 x 1,080 model looks amazing thanks to the LED backlit IPS panel. At this level the Alienware will plow through whatever games you care to play, but more grunt from a dual Radeon R9 290X crossfire setup is just $391.60 more.

You can connect to an external monitor by HDMI or mini DisplayPort and you get 4x USB 3.0 ports for your peripherals. It's a shame there is no 802.11ac Wi-Fi (n spec only) but you do have Bluetooth 4.0, Killer NIC Gigabit LAN and a webcam.

The Alienware also packs extras such as a slot loading DVD drive, a backlit keyboard and trackpad and a subwoofer to back up the already good speakers.

Verdict

Offering great value for those who want a very large screen.

★★★★☆

$2,499 | WWW.ASUS.COM

ASUS G750JX

Stand out style backed up by gaming substance.

Hidden under the Stealth Fighter inspired wedges of the G750JX is hardware put together specifically for gamers. The powerful quad Core i7-4700HQ teams up with 16GB of RAM and a 256GB SSD for serious number crunching prowess. The NVIDIA GeForce GTX770M is no slouch either and will run the latest games without comprising detail settings. The 17-inch 1,920 x 1,080 screen has an extra wide 140 degree viewing angle and is 120Hz – so it's 3D Vision compatible.

The addition of aluminium to an otherwise plastic shell helps give the ASUS a very solid, quality feel. Even the speakers are good, using a separate subwoofer to add some much needed bass. The dual rear fans are designed to vent heat and noise backwards and do a surprisingly good job – even when gaming the G750JX never gets uncomfortably loud.

While never pretending to be anything but a big chunky gaming laptop, the wedged shape of the G750JX hides the fact that it's 50mm thick and weighs in at a hefty 4.8kg. Still, this gives room for extras such as a Blu-Ray drive, secondary 1TB hard drive and a large battery that provides an impressive 3.5 hour life.

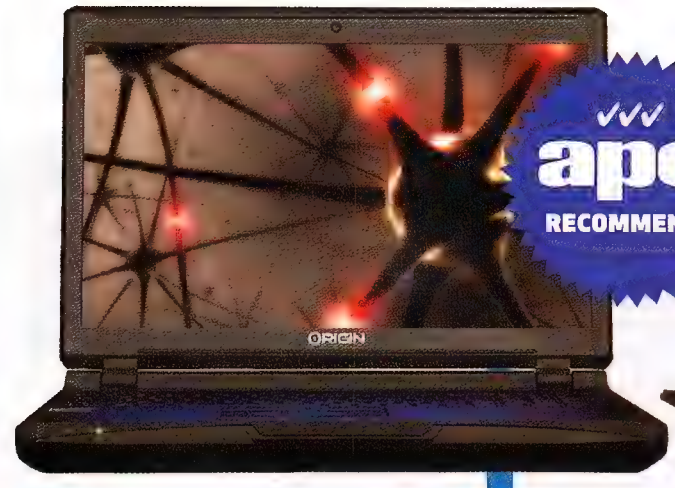
Connectivity is above average, with a webcam, 802.11ac Wi-Fi, Bluetooth v4.0, 4 USB 3.0 ports, Gigabit LAN, HDMI, mini DisplayPort, VGA, card reader, 3.5mm audio I/O and even a Thunderbolt connector.

If you have a little more cash to spend and want higher performance, the G750JS model variant has a more powerful GeForce GTX870M GPU.

Verdict

Gamer focused with plenty of style and power.

★★★½☆



apc RECOMMENDS

$4,499 | WWW.ORIGINPC.COM.AU

Origin EON15-S

Custom built for your gaming pleasure.

When the Origin boffins put together a gaming PC, they don't do it by half measures. The EON15-S might only be 15-inches, but it's a monster at heart. The key gaming credential is the NVIDIA GeForce GTX 880M GPU. It's not alone either, with an Intel Extreme Core i7-4930MX CPU, 32GB of Corsair RAM, dual Samsung 256GB SSDs and a 1,920 x 1,080 15.6-inch screen. Gaming is handled with aplomb and there is not a new title out there the EON15-S can't run.

It's not slim or light at 3.5kg, but the soft touch plastic and tough construction make the EON an easy laptop to carry around or throw in a bag. The keyboard has a quality feel, especially as its backlit, though the small touchpad can feel a little cramped. All the high end hardware needs a lot of cooling but the EON15-S is not unpleasantly noisy at full blast. Still, it has some pretty decent ONKYO speakers driven by a SoundBlaster audio card to offset the noise.

The EON15-S has 3 USB 3.0 ports, a single USB 2.0 connection, FireWire and an extra eSATA USB 3.0 combo port. You can output video via HDMI or mini DisplayPort and audio via S/PDIF or 3.5mm I/O jacks. It's also got 802.11n Wi-Fi, Gigabit LAN, Bluetooth, a fingerprint reader, an SD card slot and a webcam.

While we tested a high end EON15-S (with price to match), you can actually totally customise your order from as little as $2,169.

From a more efficient CPU to different drive configuration, the EON15-S can be whatever laptop you want it to be.

Verdict

Customisable power that holds no punches.

★★★★½

$2,599 | WWW.TOSHIBA.COM.AU

Toshiba Qosmio X70

Affordable big screen gaming

Remarkably unassuming for a gaming machine, the X70 can easily pass for a chunky business oriented laptop. Fortunately its gaming cred is good, with a GeForce GTX 770M with 3GB of GDDR5, 16GB of DDR3 RAM, an Intel i7-4700MQ CPU. There is also a 2TB hard drive with an 8GB SSD running in a hybrid setup to improve performance. The large 17.3-inch screen is a slight giveaway that the X70 loves to entertain, with its full HD 1,920 x 1,080 resolution. In use colours really pop and contrast is excellent thanks to the glossy coating, but reflections can be an issue.

Plenty of aluminium in the frame has resulted in relatively light laptop that still feels incredibly solid. It also has a very solid and nice to use backlit keyboard along with a large accurate touchpad. While not silent under normal usage, the X70 doesn't get annoyingly loud when gaming. Harmon Kardon speakers and a Blu-Ray burner make the Toshiba a capable media machine. The battery life is a bit of a letdown and will barely last an hour if you doing actual work. You won't be short of USB 3.0 ports, with 4 scattered about, along with Gigabit LAN, an SD card slot, HDMI, VGA and 3.5mm audio I/O. It's also got the usual 802.11n Wi-Fi, Bluetooth and a webcam.

The X70 comes in a number of spec levels, but you are better off upgrading the RAM yourself. Make sure you shop around or the X70 gets expensive fast.

Verdict

A well put together gaming PC that blends in.

★★★½

Searching for pointer perfection

Is laser really better than optical when it comes to gaming mice? Bennett Ring puts a variety of both types through their paces to find out.

Technology is like fashion in a lot of ways – every few years, older styles become popular again. We've seen it in the resurgence of the decade-old mini-ITX format and the impending second revolution in virtual reality. Another range of PC products undergoing this retro refurbishment are the sensors used in gaming mice. About a decade ago, most mice used optical sensors, but then laser sensors took over. However, in the last year or two, optical mice have made a comeback. Let's see why.

HOW THEY WORK

Optical mice first hit the scene back in 1999, replacing ball mice and their fluff-stuffing rollers. The Optical sensor is basically a tiny camera, with a small LED bouncing red light off the mousing surface onto a CMOS sensor, thousands of times per second. The rate at which it does this varies, which can alter the accuracy of the mouse. This CMOS sensor then passes each image to a digital signal processor, which looks for changes in the images, and then interprets those changes into mouse movements.

Optical mice were all the rage until Logitech unveiled its first laser mouse in 2004 , which worked on a very different, much more complex process known as Laser Doppler Velocimetry. A laser diode on the bottom of the mouse emits a laser beam aimed at the mousing surface, at a certain angle and frequency. As the beam bounces off the surface, its frequency is altered. The laser diode also contains a photodiode which detects the reflected light, specifically the way that it interacts with the outgoing laser, which produces something known as a beat frequency. Tuning forks do the same thing – place two next to each other, each operating at slightly different frequencies, and you'll hear a third beat frequency, which is the difference between the two. The laser diode does the same thing, measuring the beat frequency to figure out which direction the mouse is moving and the speed at which it moves.

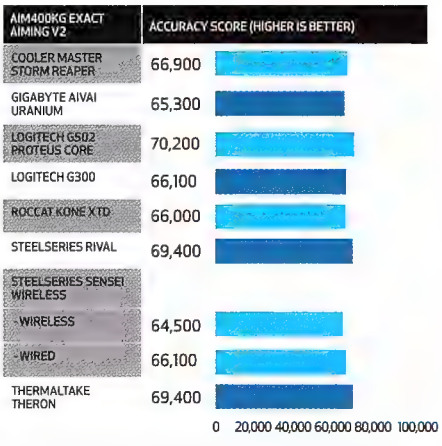
Logitech claimed these laser mice were 20 times more accurate than existing optical mice and could also operate on a wider range of surfaces, including reflective surfaces like glass, that confused the heck out of optical mice. So why are optical mice making a comeback?

We asked CoolerMaster and SteelSeries this exact question, but unfortunately neither company replied despite being given a week to respond. In the past we've spoken to several mouse makers, and all claimed that there was really very little to differentiate the two technologies, suggesting the resurgence of optical could be more of a marketing drive than anything else. However, some laser mice can show issues with acceleration and correction of movement, especially at higher speeds, a problem that optical mice don't have. It seems that this is the only reason some people prefer optical mice over laser-powered mice.

We've rounded up eight of the most popular mice on the market, looking at a mixture of both optical and digital, to see which ones measure up. The vast majority of gaming mice are still laser based, which is why so few of our samples used optical sensors. Note that sensor accuracy is just one factor; you should also consider the number of buttons, macro functionality, wireless versus wired, ergonomics and price.

LABS HOW WE TESTED

All mice were tested on the infamous Func Surface 1030 XL mousepad, using a CoolerMaster Skorpion Mouse bungee to stop cable tangle. Rather than test in game, we used the Exact Aiming V2 accuracy tests at **aim400kg.ru/** to measure accuracy, along with drawing a circle in Paint, a test which can show issues. All mice were set to a relatively low DPI of 800 for the tests, to ensure equal footing.



* See aim400kg.ru/en for more details on Aim400kg.

DPI does not equal accuracy

One of the main specs mentioned on the box of a gaming mouse is the Dots Per Inch (DPI) that it measures, and many assume that the higher this is, the more accurate the mouse is. This assumption is incorrect. While in the past higher DPI sensors tended to be better quality, these days it simply means that a higher DPI mouse will move faster over a smaller area than a lower DPI mouse.

Grip types

Gamers tend to hold their mouse in one of three ways. The palm grip sees the mouse nestled all the way back into the palm of the hand, with the full weight of the hand resting on it. It's comfy, but not that accurate. The fingertip grip is the most taxing, as the user doesn't rest any weight on the mouse at all, only making contact with the mouse via their fingertips, but it tends to be the most accurate. The claw grip is a compromise between the two, with the user's hand almost hovering over the mouse, with only slight contact between the palm and mouse; the fingers do most of the movement.

$85 | WWW.COOLERMASTER.COM.AU

Cooler Master Storm Reaper

Is the premium price justified?

This mouse is definitely designed for palm users, as its broad dimensions make it feel rather large. Despite the size, it glides across mouse pads beautifully and smoothly, as it has two huge strips of PFC material down each edge, much larger than the contact points of other mice. If you don't like the heavier weight, you're out of luck, as there aren't any removable weights.

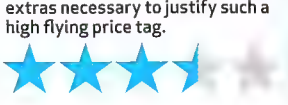
Left handers won't gel with the righty design, but it's a good fit if you're of the latter club. A small indentation for your thumb combines with the soft rubbery paint job to make it very comfortable. Three buttons adorn the left side, with just another two on the top for DPI adjustment. One of those on the left is a clutch button; holding it down lowers the DPI dramatically to 200 DPI, perfectly for lining up long-range sniping shots. The aluminium scroll wheel clicks reassuringly, but doesn't have any sideways movement. The main left/right buttons both have just the right amount of play

Avago's newest 9800 laser sensor is used within, delivering up to 8200 DPI. Downloading the software revealed the inclusion of angle snapping, 4 DPI presets, macro recording but no lift-adjustment. Our accuracy tests didn't go too well, but at least the Paint circle reflected little to no jitter.

The Reaper is a solid, comfy mouse, but it lacks the features – such as more buttons, adjustable ergonomics or finer software control – to justify this high price point.

Verdict

This comfy mouse lacks the added extras necessary to justify such a high flying price tag.



$129 | WWW.GIGABYTE.COM.AU

Gigabyte Aivia Uranium

More than a mere mouse.

As you can see, this mouse comes with a unique OLED display that serves three purposes – battery charger, radio transmitter and information display. While Gigabyte has opened the software up for anybody to create new uses for the display, it's currently limited to the basics – showing CPU temps, playlist info and mouse specs. Despite feeling gimmicky, it's quite handy being able to see exactly what DPI you're running at.

The mouse itself is surprisingly large, and only works for right handers. It's another heavyweight that can't be adjusted. Movement across our mousing surface was acceptable, though not quite as smooth as CM's Reaper.

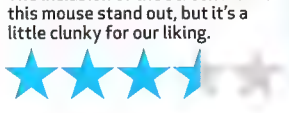
The sensor used within is the Philips' Twin Eye Laser PLN 2032, which has a maximum DPI of 5,600. Four buttons adorn the right hand side, with the usual two DPI sliders on top. A third top button is used for switching profiles, while the sideways tilting scroll wheel is a nice touch. The main left/right buttons require a little more force than many gaming mice, but will hopefully loosen over time.

For testing we ran the mouse in wired mode, as we still have doubts about wireless mice when it comes to gaming. It didn't fair too well in the accuracy mode, as the heavy weight and grabbier base made it harder to track the target.

Still, if you're looking for something a little different, and don't mind the extra weight and size, the Aivia Uranium definitely delivers more than most other mice thanks to the OLED screen. Sadly that also bumps the price right up.

Verdict

The inclusion of the screen makes this mouse stand out, but it's a little clunky for our liking.



$75 | WWW.LOGITECH.COM.AU

Logitech G502 Proteus

Not your average Logitech mouse.

Logitech are known for building reliable, yet slightly boring, mice. The G502 shakes off these shackles, looking like a cutting edge killing machine. It's specifically designed for FPS players, thanks to a few unique features.

It's a very slim and light mouse, and the huge contact pads help it soar smoothly across your mouse surface. The thumb rest makes it very comfortable, but limits it to right handers. It includes the removable weights that Logitech first introduced years ago, but they're now designed in such a way that you can change the mouse's centre of gravity. Very cool. The left side of the mouse has five different buttons; one is used for sniping slow-mo low DPI, while two of them are placed within reach of your right pointer finger. There's also a DPI switcher on the top, flitting between up to five DPI levels, as well as a shift button that changes the scroll wheel from freely rotating to a notched mode, better used for weapon switching in-game.

Opening the brilliant Logitech software reveals a surface tuning feature, which tweaks the sensor to match one of three settings – cloth, hard or factory default. It's easy to configure up to five different profiles, each of which can feature up to five DPI modes and enable or disable angle snapping.

The laser sensor supports an industry-leading 12,000 DPI, but we tested at 800. We scored one of the highest accuracy tests, while the paint test showed no jitter or acceleration problems. Given the feature set, price and amazing accuracy, this mouse is very hard to beat. Logitech is back in the game.

Verdict

This super accurate mouse helps Logitech regain its rightful place as a top gaming mouse producer.

★★★★★

$30 | WWW.LOGITECH.COM.AU

Logitech Gaming Mouse G300

A budget friendly performer.

The first optical mouse in our roundup also happens to be one of the most affordable, but that doesn't mean it feels cheap. Considering the incredibly low price, it's surprisingly capable, especially if you're a leftie.

The G300 has been around for a couple of years, and is one of the few ambidextrous mice on the market. Both sides are indented, providing a perfect resting place for your thumb. It's quite a small mouse, making it suitable for all types of grips, though gamers with big hands will likely find it just a tad too small. It's also very light, yet Logitech's usual weight-adjustment system isn't included, probably to help keep the price down. Due to the ambidextrous design, none of the extra gaming buttons are within reach of the thumb; instead there are two small buttons on the outer edge of both the major left/right buttons. Two more sit in the middle to adjust the DPI, which maxes out at just 2,500 DPI. All can be remapped and configured using Logitech's brilliant software interface, which uses the same layout across all of its devices.

Movement across the mouse pad is relatively smooth, though the mouse feet aren't very large; the lighter weight helps make up for the smaller contact points. Despite the relatively old optical sensor, our accuracy test result was very solid for such an affordable mouse. Our paint test did show a little jitter though.

Still, at just thirty bucks, this is a bargain of a gaming mouse. If you're on an extremely tight budget, the G300 is well worth the meagre price.

Verdict

It might be getting a bit long in the tooth, but this budget mouse will do the job if you're lacking funds.

★★★½☆

$119 | WWW.ROCCAT.ORG

Roccat Kone XTD

Overpriced for its feature set.

The soft paint used to cover this mouse is amazing stuff. It feels so soft and silky to the touch, instead of the harsh, cold plastic of other mice, that you won't want to take your hands off it for hours. It's quite a striking mouse to look at as well, with twin LED strips running the length of the mouse that pulse through the colour of the rainbow.

It's a rather large mouse, easily filling smaller palms, yet doesn't feel too heavy. Four removable weights allow it to be tailored to your tastes, and it glides across mouse pads thanks to the large contact patch at the rear. For a gaming mouse of this price, it's got one major issue though – a severe shortage of extra buttons and features. There are just two within reach of the thumb, with another two on the top for DPI adjustment, and then one hard to reach button in front of the scroll wheel. Roccat claims double this number though, as one of the buttons operates as a shift key, allowing every other button to have twin functions mapped to it.

The scroll wheel is tasty though, with the perfect response for weapon switching. The software interface is relatively intuitive, and is one of the few applications to support mouse lift distance. There's even an achievement screen, showing the total number of clicks for each button, and stats like CPM. While it also comes in optical, we were sent the laser version, which uses the same Avago 9800 sensor of the CM Storm Reaper, it's why our accuracy tests were almost identical.

The Kone XTD is comfortable and accurate, but is extremely overpriced considering the limited feature set.

Verdict

This large mouse is comfortable and accurate, but lacks the added extras associated with its cost.

★★★☆☆

$65 | WWW.STEELSERIES.COM

SteelSeries Rival

The masters of laser deliver an optical solution.

The SteelSeries Sensei is seen by many as the best mouse on the market. However, it uses a laser sensor, hence the arrival of the Rival, giving gamers the option of a SteelSeries mouse based on optical technology.

At first glance, the Rival looks like a very simple product. It's got a very traditional shape, with a soft, smooth top surface, while each side uses ridged rubber for extra grip. There are just three extra buttons in addition to the main left/right; two thumb buttons, and a DPI switcher on the top. It can only store two different DPI settings, which is what most gamers use anyway. There's something about the feel of the main buttons that is just right, with a soft yet responsive click. Ditto with the scroll wheel's notches.

The glowing lights on the palm wrest logo and scroll wheel can be changed to match your gaming den's colour scheme, and it's managed via the SteelSeries Engine 3 software. This application is perfect, offering a huge range of configuration options in a very clean, clear interface. Acceleration can be disabled entirely, as most gamers prefer, but it can also be tailored to suit personal tastes too.

The optical sensor used within has a maximum DPI of 6,500, making it one of the highest when it comes to optical sensors. When set to 800 DPI, the Rival scored one of our highest accuracy settings. It might not be festooned in lots of buttons and features, but this affordable optical mouse is perfect for those who want an accurate mouse that is easy to setup and comfortable to use.

Verdict

A simple, affordable but downright deadly mouse, thanks to its extremely high accuracy.

★★★★☆

$169 | WWW.STEELSERIES.COM

SteelSeries Sensei Wireless

The king of mice cuts its cord.

If you're really serious about your gaming, we'd advise caution when considering a wireless mouse. Despite claims of 1ms response times, they tend to introduce noticeable delay to mouse clicks and motions. However, we're huge fans of the wired version of the SteelSeries Sensei, so were keen to see how the wireless version fared. Does it really live up to claims that its wireless connection is just as responsive as a USB cable?

Like the original Sensei, the wireless version uses a very plain, ambidextrous design. Rather than the polished chrome exterior of the original, this new version uses the same rubberised paint finish found on most of these mice. There are two extra buttons on each side, accessible by your thumb and pinkie finger, along with a DPI switcher on the top.

The scroll wheel on our sample felt a little tight, and it sadly lacks side-scrolling. The excellent SteelSeries Engine 3 software exposes a range of advanced settings, such as lift height, angle snapping and polling rate – we set the last to 1,000Hz, the same speed as a USB mouse.

The MS Paint test showed no jitter or signal dropouts, but the real test was our accuracy simulator. In wireless mode, the Sensei scored one of the worst results in the test. Hooking it up to the USB cord, turning it into a wired mouse, saw a decent improvement, placing it in the middle of the pack.

As a result we'd advise you to steer clear of the wireless version – there's still too much latency with the tech to allow the perfect headshot.

Verdict

We love the original Sensei, but the wireless version hampers its accuracy, while doubling the price.

★★★☆☆

$59 | WWW.THERMALTAKE.COM.AU

Thermaltake Theron

Designed specifically for RTS games.

The Theron has a rather odd shape – as well as the usual thumb indentation, both left and right buttons also have indentations. They feel a little strange at first, but after a short while this mid-sized mouse fits like a glove.

Twin thumb buttons are in easy reach, while a single pinkie button adorns the opposite side. As usual, twin DPI buttons on top allow the user to switch the DPI level. The software allows custom profiles to have anywhere between one and four different DPI settings, with the laser sensor maxing out at 5,600 DPI. Thermaltake love its LEDs, and there are several on the Theron; one under the palm logo, another under the scroll wheel, and then three more skirting the base, like the Neon lights used in the vehicles of *Fast & Furious*.

A small tray underneath reveals removable weights, and there are also two more buttons found on the bottom – one to change profile, the other to change polling speeds. Being placed on the bottom makes them rather impossible to use mid-battle, so we're not quite sure why Thermaltake bothered, especially since the software does the same job anyway.

Our accuracy testing showed the laser sensor used within does a great job, with one of the better results in the roundup. Considering the great price and healthy number of buttons, this is an excellent gaming mouse on the more affordable end of the scale.

Verdict

Delivering excellent accuracy at a great price point, the Theron is well worth considering.

★★★★☆

FSP

Rating of 90 from Tweak Town

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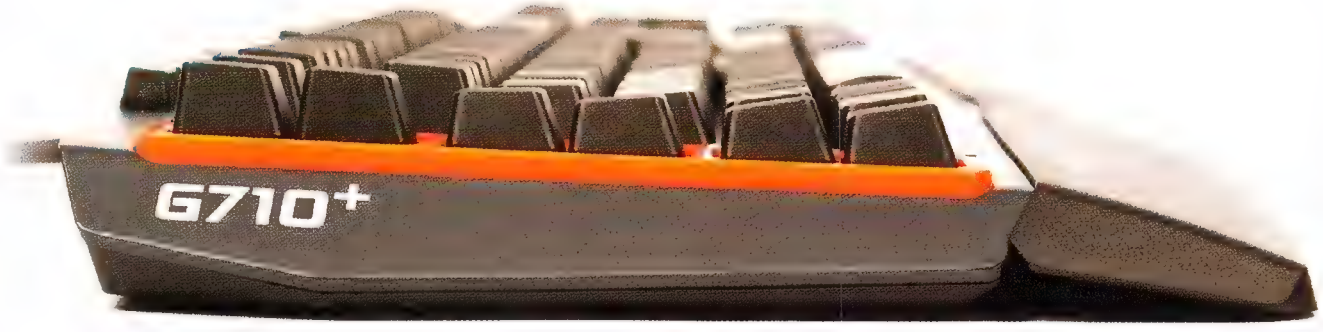


Making the switch

Born in the early 1980s, mechanical-switch keyboards have made an astonishing comeback since their near-extinction. Bennett Ring tests eight brands' offerings to find which deliver the best clack-for-buck.

Over the last couple of years, gaming keyboards have undergone a retro revolution quite unlike anything we've seen in PC land before. They've driven a DeLorean back three decades, ditching modern technology for a type of key that first debuted in the early 80s. Mechanical keyboards are back, ready to drive your friends and family insane with their loud clickety clack keys.

Until recently, the most common gaming keyboards were what's known as 'full-travel membrane' keyboards, which are still popular outside of gaming. Underneath each key is a rubber dome, with a capacitive core at its centre. When the user pushes the key, the dome flexes downwards, pressing down on a membrane which registers the contact as a keystroke. These keyboards are very cheap to make, as there are few moving parts, and it's also resistant to spills, as the electronic circuitry is partially protected by the rubber membrane that each dome forms a part of. Their silent keystrokes are also a godsend in today's open-plan offices.

Before the invention of these quiet keyboards, most PCs used keyboards with buckling spring switches, which all-but died off after the cheaper membrane tech took over. Yet a small niche of hardcore gamers and typists still used buckling based keyboards, and IBM's Model M keyboard was seen as the Stradivarius of keyboards in those small circles. First released in 1985, these exquisitely engineered mechanical products were still working 20 years later. The lucky few who owned one preferred the mechanical keys within.

Today's mechanical keys, however, are built quite differently to the Model M and its buckling switches, though they do share many of the same benefits. In a mechanical keyboard, a self-contained switch is behind every key, containing a base, spring and a stem. Many gamers love them, for several key reasons. Most mechanical switches register the keystroke when the key is only half-depressed, shaving precious milliseconds off the time needed to register each keystroke. Secondly, the loud click emitted by each keystroke makes it easy for the gamer to confirm that the keystroke has been registered. These keys also require a little more force to activate, making it hard to accidentally activate the wrong key. Finally, hard-plastic and spring set up used in mechanical keyboards should essentially last forever – the rubber in a membrane keyboard deteriorates over time.

> "Mechanical keyboards are back, ready to drive your friends and family insane with their loud clickety clack keys."

There are dozens of types of mechanical switches on the market, but by far the most popular are those made by a company called Cherry.

The company makes several types of switch, using different designs to deliver different physical feedback when a key is pressed. Each design is known by a colour designation – such as blue, brown, red or black – which is derived from the colour of plastic used by Cherry when manufacturing the keys.

Blue switches are generally the most-favoured among pro gamers – when pressed, they provide strong feedback both acoustically (generating a very loud click) and physically (with a noticeable 'hump' that requires a little more finger force to overcome) at the point of actuation. Brown switches have a similar 'hump' as their blue siblings, so you can tell physically when the key has been pressed, but are much quieter. Red and black switches lack the hump, travelling straight up and down, but using different springs – red switch springs are fairly soft and loose and can often be pressed just by resting your fingers against the keys, while black switch springs are tighter and more resistive, so require a little more force to be activated.

$200 | WWW.COOLERMASTER.COM

Cooler Master CM Storm Mech

A blue-switched, metal-clad behemoth.

It wasn't long ago that $200 for a mechanical keyboard was considered a bargain, but times have changed. At this price, the Mech is one of the most expensive in our roundup, but Cooler Master has given buyers plenty of reasons to foot the bill.

This thing is built to last – the silver in the photo above is all aluminium, it's one of the most solid and stable typing platforms around. The black palm wrist is plastic though, and to be frank it's not the most comfortable we've seen. There's a wide gap between it and the aluminium keyboard, designed to show off a ridge of LED lighting but which presses into the palm of the user. It's also very angular, forgoing the flowing, organic lines found in ergonomically designed products. Finally, it's lacking the smooth rubberised coating found on most other wrist-rests; we wish it was detachable, so it could be replaced with something more comfortable.

Each key is backed by a back-lit Cherry MX Blue switch, which is described as having a relatively light touch, with a tactile bump as each key registers. These are also rather loud switches, so your roommates probably won't appreciate it during your 3am raids. Twin USB 3.0 ports adorn the rear of the keyboard, alongside the mic in/headphone out ports. Five dedicated macro keys sit on the left hand side of the keyboard, which can be configured using Cooler Master's simple software.

The Mech ticks all the necessary boxes, apart from comfort, which is a biggie. It's also rather pricey thanks to it being built like a tank.

Verdict

Solid and stable, but it's expensive and not particularly comfortable.

★★★½☆

$160 | WWW.CORSAIR.COM

Corsair Vengeance K70

Meets your mechanical needs in a compact package.

Compared to some of the brutes in this round up, the K70 is a very trim keyboard indeed. The left and right sides extend about 2mm past the edge of keys, and the bottom and top don't have much more room than that either. It'll fit a cluttered or smaller desk much more easily than bigger 'boards, yet still has a full-sized keyboard.

The chassis is built from sturdy aluminium, and the key layout couldn't be any more ordinary, which is just fine by us. Having to re-learn a weird layout so you can frag in the dark isn't much fun. The detachable wrist-rest has a nice soft rubber coating, although it's a tiny bit low for our liking – a touch more height might have been even comfier. While most keyboards allow the function keys to double as media keys via the use of a shift key, the K70's dedicated media control keys are a pleasant addition. Found just above the numpad on the right side of the keyboard, there's even a nice, solid volume wheel.

Cherry MX Brown switches powered the K70's keys, a switch that is described as requiring little force, registers a tactile bump when pressed, yet lacks the clicky sound. Compared to a membrane board, it's still relatively loud. Corsair also offers the K70 with Cherry MX Red and Blue keys, depending on your preferred type. Each key is backlit, including brightness controls and the ability to only have certain keys lit.

The K70 is a well built, well rounded keyboard, and it just happens to have a rather appropriate price. Recommended for those looking for a slightly smaller keyboard.

Verdict

A pleasing combination that delivers all the essential features in a trim design at a nice price.

★★★★☆

$140 | WWW.GIGABYTE.COM.AU

Gigabyte Aivia Osmium

Component-maker Gigabyte tries its hand at a mechanical keyboard.

With its wrist-rest attached, this behemoth will happily eat any spare desk space you might have. The all-plastic wrist-rest is almost as wide as the keyboard, which gives good support. Unfortunately the plastic finish means it's not the comfiest. It's also got one of the steepest typing angles when the legs are extended, which makes it easier to reach all of the keys.

Unlike the preceding two keyboards, the Osmium is built entirely from plastic. It still feels very solid and heavy though. An extra row of keys along the top of the keyboard includes five macro keys, as well as rotating wheels for system volume and backlight brightness. Strangely we couldn't get the volume knob to work, yet clicking on it muted the system, as it's meant to. Another large button on the top right of the keyboard changes the profile it's set to, and each profile can have different macros.

Speaking of keys, the Osmium comes with Cherry Red MX switches, which require a relatively light touch to activate. They're linear, which means there's no tactile bump as the key is pressed; instead the pressure required increases the further the key is pressed. The Red switches are also quieter, but I've been told off more than once for typing late at night on one.

Given the proximity in price to the K70, the Osmium ends up looking a little overpriced, as it lacks the metal finish and dedicated media keys of the K70. As a result, it's only worthy of your attention if you can find one for a much cheaper price than the $140 it's currently going for.

Verdict

A gargantuan board with macro capabilities, but the all-plastic design doesn't match the price.

★★★☆☆

$140 | WWW.LOGITECH.COM

Logitech G710+

Logitech somehow nails it with its first stab at a mechanical gaming keyboard.

As one of the biggest brands in gaming peripherals, it took a surprisingly long time for Logitech to release a mechanical keyboard. The 710+ is one of the more affordable boards around based on street pricing. So, let's see what this respected company has come up with for one of its first mechanical efforts.

The first thing we noticed was the feeling of each key – they felt softer than most mechanical keys, with a much quieter click. The spec sheet doesn't mention them, so we assumed they were built in-house. However, it turns out they're Cherry MX Browns, and each reportedly has a special O-ring added, which could be why this keyboard sounded much quieter than the Corsair K70. Now, most mechanical keyboards are expensive thanks to the higher cost of each switch, so we assumed the 710+ would have a very high price given the large number of additional keys. Six macro keys line the left side of the keyboard, with another four at the top, which control the currently loaded profile. Then there are the custom media controls and lighting controls, along with a volume knob. Each key is backlit, with customisable brightness and on/off functionality.

How Logitech managed to deliver all of these extra keys for such a low street price is beyond us. It's even very comfortable to use, despite the plastic wrist rest. It might be Logitech's first mechanical keyboard, but they've absolutely nailed it. Highly recommended if you like the softer sensation of Cherry Brown switches, and even more so if you need a quiet mechanical board.

Verdict

Cherry-brown switches are much quieter, plus a huge range of features at a keen price. Nuff said.

★★★★★

$149 | WWW.PCCASEGEAR.COM.AU

Ducky DK9087 Shine 3

Simple but strong.

Ducky is a rather obscure maker of keyboards, only found in a limited number of stores in Australia. However, the brand has proven very popular with hardcore gamers due to their incredible build quality, and unique form factor. The DK9087 is perfect for those who game from the couch using a lap board, as the lack of the numpad makes it one of the smallest gaming keyboards on the market.

This version of the DK90087 focuses on delivering an impressive light show when in use. There are around five different light modes, from spooky pulsing to a mode where only keys that you've touched light up. Buyers needn't settle on one specific type of Cherry MX switch, as every major colour is available. Our sample came with Cherry MX Red switches, the type favoured by first person shooter players.

Helping to make the board so reliable is the use of a dual layer PCB under the keys, even though it's mainly built from plastic. There are no macro keys or other features, making this rather expensive compared to the competition.

Verdict

Strong yet simple, the lack of features makes this niche keyboard a hard sell though.

★★★☆☆

$230 | WWW.ROCCAT.ORG

Roccat Ryos MK Pro

Why the high price?

As one of the biggest keyboards in our roundup, the MK Pro needs plenty of desk space to call home. It's also saddled with the highest price tag in the roundup, well in excess of other, similarly-specced keyboards. Why does Roccat think they can charge such a premium?

With five macro keys and three mode keys, there are plenty of extra keys for accessing your macros. The unique position of three of these just under the space bar makes them much easier to reach than other profile mode keys, a touch other keyboard makers would do well to replicate. A couple of USB 2.0 pass through ports are welcomed, though USB 3.0 should have been the norm at this price point.

Four different types of Cherry MX key are available, and they're all backlit. Once again we see a board focusing on delivering more light modes than your local disco, but gamers will tend to stick with simply lighting the entire set. Despite the high price point, the entire board is built from plastic.

The Ryos MK Pro has many of the features found on premium boards, yet lacks many others. As a result we simply can't justify the incredibly high price point, especially when boards like Logitech G710+ do everything so much better.

Verdict

It might look large and impressive, but that high price simply isn't warranted.

★★★☆☆

$99 | WWW.STEELSERIES.COM

SteelSeries 6G v2

Like the Sensei mouse, this one aims at simplicity.

Compared to most of the keyboards in the roundup, the 6G v2 looks strangely... normal. It's not big nor small, there are no flashing LED lights or backlit keys, and there's not a flaming dragon in sight. Nope, the 6G v2 has simple goals – to build a regular keyboard backed up by the power of mechanical keys.

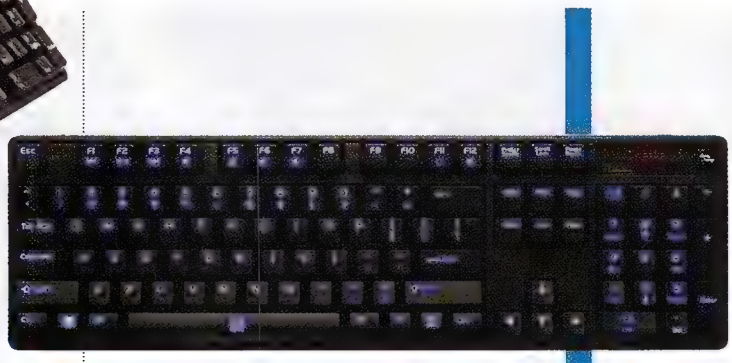
Built using Cherry MX Black keys, they require medium force and provide a linear feedback. Unlike nearly every other keyboard in this roundup, SteelSeries has foregone backlighting entirely, a very strange omission considering how many gamers like to play in the dark. The plastic exterior would suggest a light build, but the use of steel backing inside makes this a seriously heavy keyboard.

There's not a macro or multimedia key in sight, yet again more features that are par for the course that SteelSeries has decided to omit. About the only noteworthy feature is the lack of any Windows keys, as gamers hate the way these tab out of a running game when accidentally pressed.

Actually, we lie – there is one other thing of note. At $99 this is the cheapest mechanical keyboard on the market, and not much more expensive than inferior membrane boards. If $100 is your budget for a mechanical keyboard , the 6G v2 sneaks in just under that; but don't expect any of the flashy features of the more expensive boards

Verdict

As cheap as mechanical keyboards get. But at this price you lose out on most features.



$106 | WWW.THERMALTAKE.COM.AU

Thermaltake Poseidon Z

The master of the seas comes at a low cost.

Like the SteelSeries 6G v2 before it, the Poseidon Z is built with one thing in mind – cost. At just $105 it's basically the same price as the 6G v2, and a big chunk of change cheaper than the rest. What corners has Thermaltake had to cut to reach such a low price?

For starters, it's one of the few mechanical keyboards on the market that doesn't use Cherry MX switches. Instead it uses switches made by a company called Kaihl, which basically imitate Cherry's range, available in both blue and brown types. We definitely found the quality to be not quite as good as Cherry switches, yet Thermaltake has blessed the keyboard with a 5 year warranty, so they must be quite confident in the reliability of these keys. Most other keyboards come with a 1 year warranty.

Like the 6G v2, the Poseidon Z is utterly devoid of added extras – there are no USB ports, or headphone jacks, or multimedia controls. It's just a keyboard with mechanical keys, which aren't actually Cherry MX keys. If SteelSeries can do the same for $6 cheaper, with actual Cherry MX keys, then we'd have to recommend the SteelSeries board for those on a budget.

Verdict

The use of non-Cherry switches is hard to justify when SteelSeries 6G v2 includes them, and is cheaper.

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Learn the basics of CODING

Les Pounder runs through the basics of Scratch for those itching to code for themselves, or looking for ways to teach others how to get started.

How do you learn to program? Typically, we think of a person sitting in front of a glowing screen, their fingers slowly typing in magic words that, initially, mean nothing to the typist. And in the early days of coding, that was the typical scene, with enthusiasts leaning by rote and typing in reams of code printed in magazines.

In this modern era, where children are encouraged to learn coding concepts as part of their primary school education, we see new tools being used to introduce programming to a younger generation. These tools aren't just for kids, though – they can help anyone learn to code, at any age.

Scratch, created by MIT, is a visual programming environment that promotes the use of coloured blocks over chunks of code. Each set of blocks provides different functionality and introduces the concepts of coding in a gentle and fun way.

For the purpose of this tutorial, we are using the current stable version of Scratch, which at the time of writing is 1.4. Version 2.0 of Scratch is available as a beta and reports suggest that it's very stable to use, but there are a number of differences between the locations of blocks when comparing version 1.4 to version 2.0.

As mentioned, Scratch uses a block-based system to teach users how different functions work in a program. This can be broken down into the following groups and colours:

- **Motion (dark blue).** This enables you to move and control sprites in your game.
- **Control (orange).** These blocks contains the logic to control your program (loops and statements) and the events needed to trigger actions, such as pressing a key. In Scratch 2.0 the events stored in Control have their own group called Events.
- **Looks (purple).** These blocks can alter the colour, size or costume of a sprite, and introduce interactive elements such as speech bubbles.
- **Sensing (light blue).** For sensing handles the general input needed for your program, for example, keystrokes, sprite collision detection and the position of the sprite on the screen.
- **Sound (light purple).** Adds music and sound effects to your program.
- **Operators (green).** This enables you to use mathematical logic in your program, such as Booleans, conditionals and random numbers.
- **Pen (dark green).** This is for drawing on the screen in much the same way as Logo (**tinyurl.com/34btzg**) or turtle graphics.
- **Variables (dark orange).** Creates and manipulates containers that can store data in your program.

By breaking the language down into colour coded blocks Scratch enables anyone to quickly identify the block they need. Children typically work via the colour coding system at first, and through the natural process of playing, they come to understand the link between each of the blocks and how they work together.

THE ENVIRONMENT

Scratch uses a clear and structured layout, which is divided into three columns. The first of these is the Block Palette. This is where your blocks of code are stored and sorted according to their function.

In the second column is the Script Area, where you can drag blocks of code from the Block Palette to add them to your program.

Scratch online

Scratch is available across many platforms. It comes pre-loaded on every Raspberry Pi running Raspbian, and is available for download from **scratch.mit.edu**, but there is also an online version that provides all of the functionality present in the desktop version, but requires no installation or download.

Head over to the MIT web site and you'll be greeted with the same interface and blocks of code as the offline version, but with a few subtle differences.

This is the latest version of Scratch, and you can save all of your work in the cloud, ready to be used on any PC you come across. If you would like to use the code built online on a computer that doesn't have an internet connection, you can save your project to a USB stick and then run it offline.

You can also download the latest version of Scratch from MIT's web site. This latest version is still in beta but reports show that it is very stable and ready for use. Scratch 2.0 uses Adobe Air and is available across all platforms including Linux. Adobe dropped support for Air on Linux a few years ago but you can still download the packages necessary for Scratch 2.0 to work.

The third and final column is the Stage. This shows the results of your programming, and can be used to interact with the game world. At the bottom of this column you'll also find the very handy Sprites Pane. This shows the sprites and assets that belong to your particular program. Clicking on a sprite will change the focus to it, enabling you to write code for it.

BUILDING OUR GAME

To write code with Scratch, we need to move blocks of 'code' from the Block Palette to the Script Area for each sprite or background that we want to use in our program.

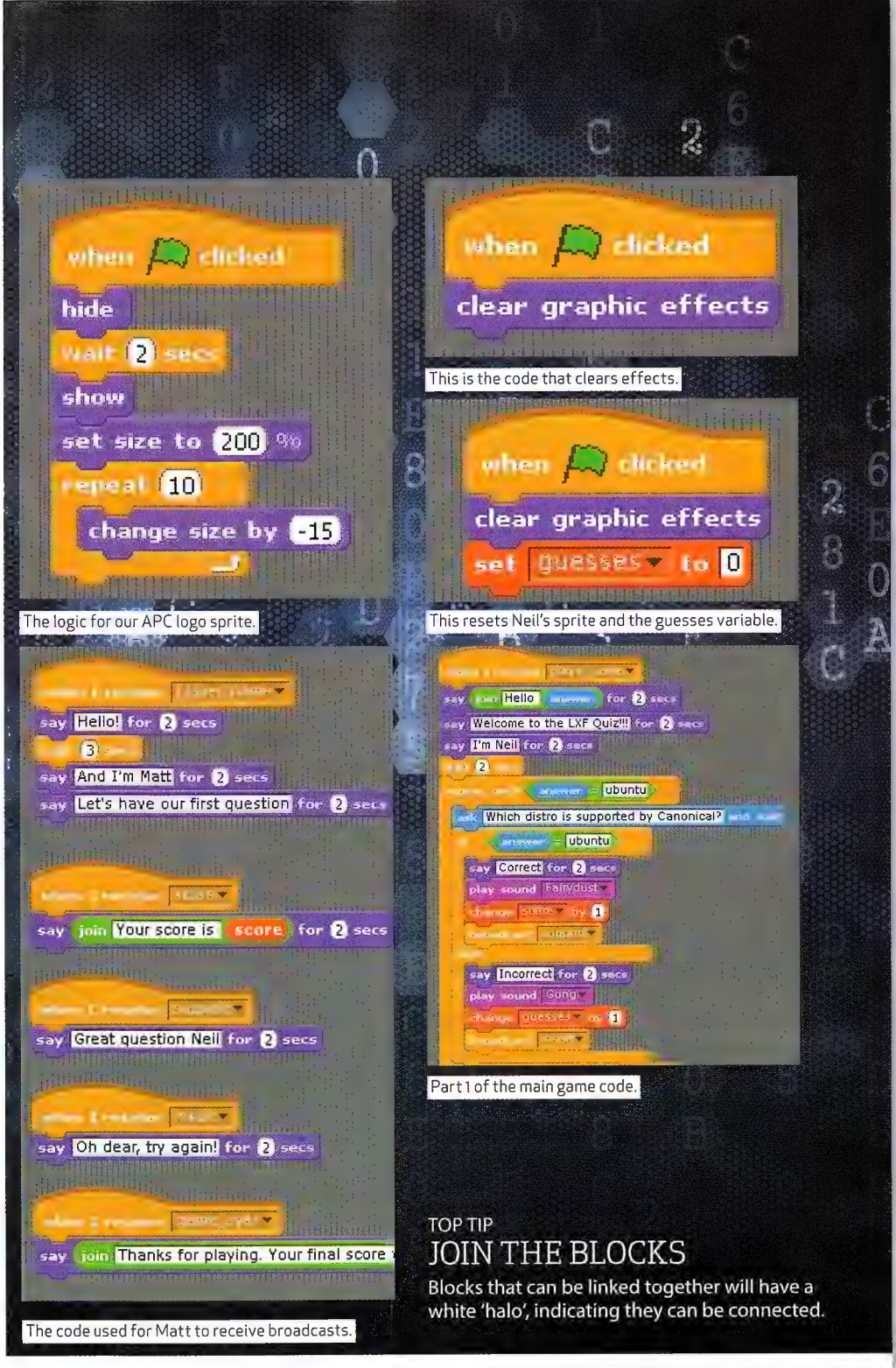
For this tutorial, we're going to make a quiz game, using Matt and Neil as our quiz masters. The purpose of the game is to score more than three points, and players must answer each question correctly to progress to the next round. If you give three wrong answers, then it's game over. Each of our sprites has its own scripts, which are assigned to run when triggered by an event. An event is typically clicking on the green flag to start the game, but it can be as complex as listening for a trigger from another sprite.

We've given our four games sprites names: Neil is Sprite6, Matt is Sprite7, the logo for the actual magazine *APC* is Sprite5 and the Game Over image is Sprite8. Each of these sprites has its own scripts associated with it, so let's take a look at what they each do, starting with the *APC* logo. I wanted this logo to appear right at the start of the game, but not be visible straight away, so my logic was as follows:

```
When Green Flag clicked.
Hide.
Wait for 2 seconds.
Show.
Double in size.
Loop 10 times and each time reduce size by 15%
```

Now let's look at the logic for Matt's sprite. Matt has five sections of code that react to something called a 'broadcast', which is basically a way to chain trigger events between sprites in the program (you can find 'Broadcast' under 'Control'). So we have a number of actions to perform once we receive these broadcasts from Neil and the Stage.

- **player_name.** The Stage sends a broadcast once the player has entered their name.
- **support.** Neil sends a broadcast to Matt once the player has answered a question correctly.
- **Insult.** Neil sends a broadcast to Matt to taunt the player.
- **Score.** Neil sends a broadcast to Matt triggering Matt to tell the player their score.
- **game_over.** Neil sends Matt a broadcast that will trigger the end of the game.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wait 2 secs
show
set size to 200 %
repeat 10
change size by -15
when clicked
clear graphic effects
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clear graphic effects
set guesses to 0
say Hello! for 2 secs
say And I'm Matt for 2 secs
say Let's have our first question for 2 secs
say join Your score is score for 2 secs
say Great question Neil for 2 secs
say Oh dear, try again! for 2 secs
say join Thanks for playing. Your final score
say Hello for 2 secs
say Welcome to the LXF Quiz!!! for 2 secs
say I'm Neil for 2 secs
ask Which distro is supported by Canonical?
say Correct for 2 secs
play sound Fairydust
say Incorrect for 2 secs
play sound Gong

The logic for our APC logo sprite.

This is the code that clears effects.

This resets Neil's sprite and the guesses variable.

Part 1 of the main game code.

The code used for Matt to receive broadcasts.

TOP TIP

JOIN THE BLOCKS

Blocks that can be linked together will have a white 'halo', indicating they can be connected.

As we can see from the screen grab at the top of page 62, for each of these broadcasts Matt is triggered to run a certain sequence of code. Matt also has a script that's run in the event of clicking on the green flag. The grab on the right shows the code that clears any special effects used on his sprite.

Let's move on to Neil. This sprite has a lot more code than Matt. This is because he's the main part of our game. First, there's the Green Flag event. What this does is triggers Neil's sprite to reset any special effects that are in use and stores '0' in the variable called 'Guesses'. The second part is the loop that controls our game. This large loop is triggered once we receive the name of the player, which is handled via the code associated with the Stage, which we will come to later.

I've broken Matt's main loop into three parts. At the start of the game, a section of code associated with the Stage asks for the player's name. It stores that as a variable called 'Answer', which is stored in the Sensing category of blocks. Once the user enters their name, the script associated with the stage sends a broadcast called `player_name`. Neil's code is waiting to receive this broadcast as a trigger event. Once the code is triggered, Neil will greet the player by name, using the 'Answer' variable.

Once we have the formalities out of the way, we move on to the main loop that controls the first question. We wrap the question in a loop that will

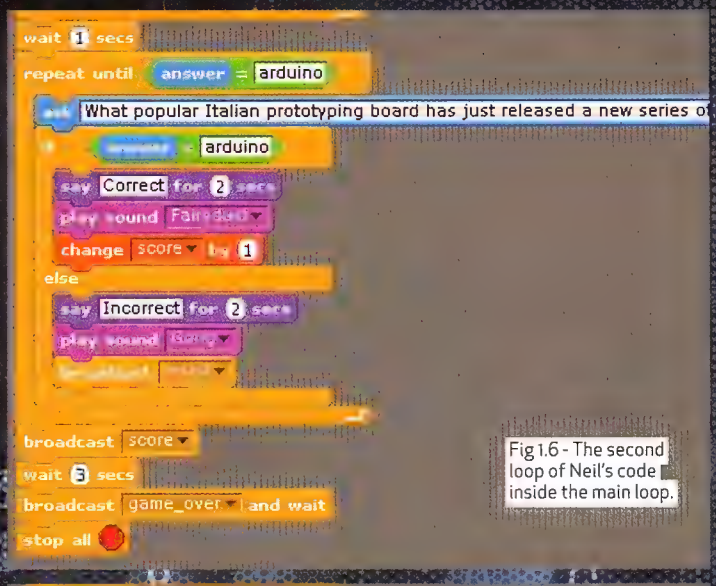
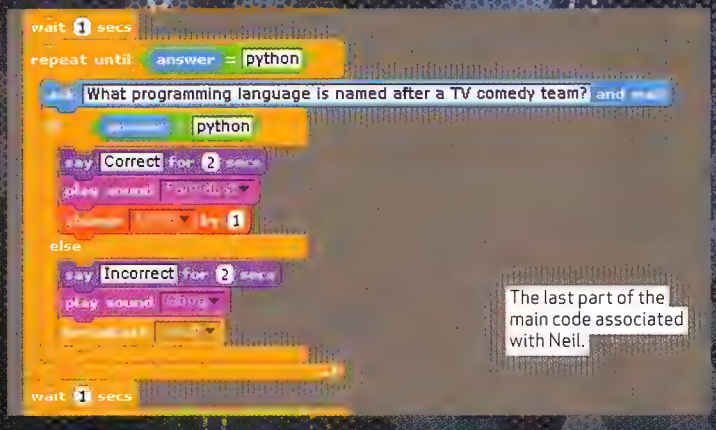

wait 1 secs
repeat until answer = arduino
ask What popular Italian prototyping board has just released a new series o
answer = arduino
say Correct for 2 secs
play sound Fairydust
change score by 1
else
say Incorrect for 2 secs
play sound Gong
broadcast score
wait 3 secs
broadcast game_over and wait
stop all

Fig 1.6 - The second loop of Neil's code inside the main loop.


wait 1 secs
repeat until answer = python
ask What programming language is named after a TV comedy team? and wait
answer = python
say Correct for 2 secs
play sound Fairydust
change score by 1
else
say Incorrect for 2 secs
play sound Gong
wait 1 secs

The last part of the main code associated with Neil.

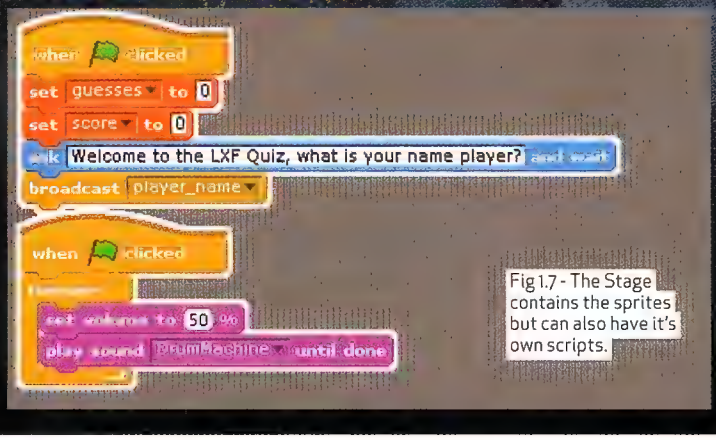

when clicked
set guesses to 0
set score to 0
ask Welcome to the LXF Quiz, what is your name player? and wait
broadcast player_name
when clicked
set volume to 50 %
play sound DrumMachine until done

Fig 1.7 - The Stage contains the sprites but can also have it's own scripts.

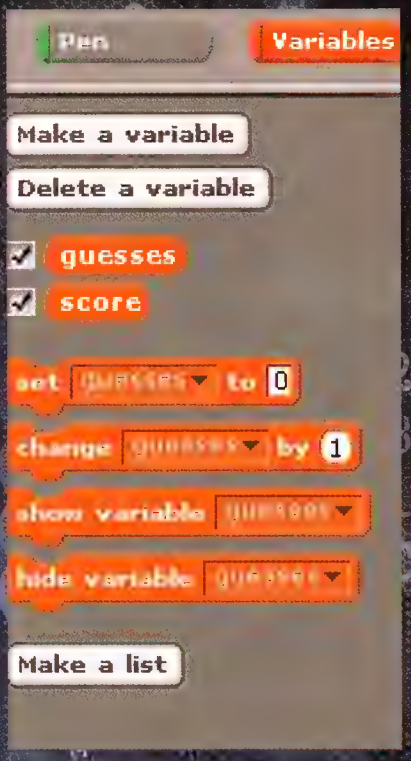
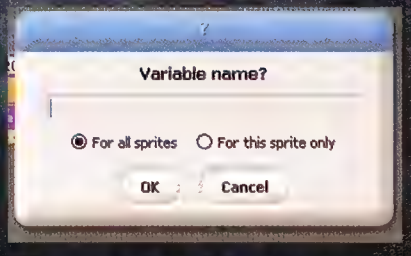


Fig 1.8 - As you can see, there are two variables in our game: guesses and score.



Hit the Make a Variable button to create a variable.

TOP TIP

EASY EDITING

Right-clicking on a block of code is a quick way to duplicate or delete your code.

repeat until the correct answer is given, which is `repeat until answer = Ubuntu`.

We then ask the question and run another loop inside of the main loop. This second loop is an 'if' statement, which uses a condition to perform a certain sequence of code if a condition is true, or if it is false it will run the code associated with else. In the case of the answer being correct, Neil will say that the answer is correct, play a sound to reward the player then alter the variable 'Score' by one point and, finally, broadcast support to Matt, who will say something nice. If the player provides an incorrect answer then Neil will say 'Incorrect', play a gong sound effect and then increment the 'Guesses' variable by one and then send a broadcast to Matt, who will taunt the player.

Part two of the code is exactly the same as the main loop of part one and the reason why is because we duplicated the code and changed the question and expected answer. To duplicate code in Scratch you can right-click on the blocks of code and select 'Duplicate' and, hey presto, you have doubled your code in just one click.

The first section of the third part is exactly the same as the main loop from the previous two parts. So let's move down to the last four blocks of code (see Fig 1.6, above). Our first block is a broadcast 'score' to Matt, this will trigger Matt to tell us the score, we then pause for three seconds to allow Matt to finish speaking. Then we send another broadcast to Matt who will then run thorough the end of game code associated with that broadcast. Lastly, we use 'stop all' to stop any scripts in the game.

The Green Flag event is the code that controls the number of guesses that the player has. We use conditional logic to say that when the number of guesses is equal to three, we broadcast 'game_over' to Matt, which, in turn, triggers the 'end of game' script.

The Game Over sprite has two scripts associated with it. The first is simply when the green flag is clicked to hide the sprite. The second script is triggered when the game_over broadcast is sent. It triggers the sprite to reveal itself and set its size to 100% . We then use a loop that will repeat 10 times to change the size and rotation of the sprite, giving us

Programming concepts

Using Scratch is great fun, and you might not even realise that you are learning to code. No matter what language you use, the underlying concepts of coding provide a firm foundation. And once learnt, they can be applied to any coding project. The main concepts are:

Sequences: A series of tasks required to be completed in a certain order. For example, the steps needed to solve a maze.

Loops: A way to repeat a sequence. They can be run forever (while true) or controlled using a for statement (for x in range(0,3)). We have used loops to control players progress in our game.

Parallelism: This is the principle of running more than one sequence of code at the same time. We've used that a lot in our Scratch game, as each sprite has its own code that run parallel to each other.

Events: This is a trigger that starts a sequence of code and the most visible event in our Scratch game is clicking on the green flag to start the game.

Data: We use a variable to store the value of our score and we can later retrieve and manipulate the score to show the players progress through the game.

Operators: These are the basic mathematical rules that we all learn in school. We can apply operators to text and numbers, which enables us to perform calculations in our code, and to iterate data if required.

Conditionals: These form the basis of our logic and provide a method for us to compare data against the input that is given by the player. We have used conditionals in our game to compare the answer given to the expected answer. If they both matched, which in Boolean logic would be classed as True, the player would be awarded a point. If they did not match, which would be defined as False, the player would have to try again.

a rotating zooming effect just like what you'd see in the classic 8-bit games of the 1980s.

THE STAGE

As well as housing our sprites, the Stage can also contain its own scripts (see Fig 1.7, left). For our game we have two sections of code on the Stage. Both sections of code are triggered by the 'click on Green Flag' event. The first part resets two variables called 'guesses' and 'score'. We then ask the player to provide their name, which is broadcast to Matt and Neil and starts the main code loop assigned to Neil. The second section of code is an infinite loop that will play the loop 'DrumMachine' continuously and set its volume to 50%.

As I mentioned earlier, variables are a great way to store data, but before we can use one we need to create it. To create a variable we need to use the 'Variables' button from the Block Palette. There you will find the 'Make a variable' button. Click on it and you will see the box on the right.

In our game we used two variables, 'Score' and 'Guesses', and we want them to be available for all sprites, so that Matt and Neil can both use them. Once created, we can easily drop these variables into our code enabling us to reuse their value many times in the game, see Fig 1.8 left for the example that we made for our game.

PSEUDO CODE

To understand the logic of this game, we're going to write it in pseudo code. This is when you write down the logic of how your program will work. For example:

```
a has the value of 0
while a is less than 10:
print on the screen the value of a
increment a by 1
```

So we have our pseudo code, but how do we express it in a programming language? First, let's do this with Scratch, then with Python. In Scratch our code will look like this:

```
[When Green Flag is clicked]
Set variable a to 0
forever if a < 10
    say a for 2 secs
    change a by 1
```

This will give the variable 'a' the value of zero. We then create a conditional loop that will only loop while 'a' is less than 10. Inside the loop we ask Scratch to print the value of 'a' for two seconds, then increase the value of 'a' by one. This loop will continue until we reach a = 9 and will stop as the next value, 10, is not less than 10. In Python, our code looks like this:

```
a = 0
while a < 10:
    print a
    a = a + 1
```

Why did I include that piece of Python code in a Scratch tutorial? It simply illustrates that there isn't a lot of difference in the logic between the two languages and that Scratch can be used to help understand the logic that powers many applications. In both Scratch and Python we create a variable called 'a' and set it's value to be zero, from there we create a loop that will continue to iterate round until it reaches nine (which is less than 10). Every time we go round the loop, we iterate a by one, allowing us to count the number of times that we have been around the loop.

TESTING OUR GAME

We've done it! We've made a game. So now let's play our game. The flow of the game should be as follows:

```
Click on green flag.
You will be asked for your name.
Matt says hello and Neil says hello and your name.
They both welcome you to the quiz.
Matt prompts Neil to ask the first question.
Neil asks a question.
A box will appear for you to type your answer.
If your answer is correct, then Neil will say so, and Matt will also say something nice.
Your score will increase by one.
If your answer is wrong, you will be taunted by Matt and the number of guesses will increase by one, leaving you with only two guesses. You will then have another chance to answer the question.
If you guess correctly, you will move on to the next question, and this will happen twice as there are three questions.
If you answer all the questions correctly, Matt will tell you your final score and then say 'Game Over'.
The Game Over sprite will appear on screen and all of the scripts in the game will be turned off.
If the number of guesses made reaches three at any point in the game, then the game will automatically skip to the Game Over screen.
```

This is just the start of your adventures with Scratch, and you can easily extend this into other types of simple games. Play around with it and discover some of the funky things it can do very quickly and simply all without leaving the drag and drop interface. ■

Secure Android

Your smartphone is now as important as your PC. Mayank Sharma investigates how to secure it...

You know, if someone was really interested, they could pinpoint your exact location right this very moment. They can even probably take your picture reading the magazine and record the gasp you just let out. Before you can gather your senses, they will have read all your messages, stolen your contacts and seen not just your credit score, but your *Angry Birds* prowess.

This isn't fiction. You have in your pockets a snooper's best friend. You take it everywhere: from your office to your bedroom, from the dining room to the lavatory. It records almost everything you do and can be made to turn against you in a matter of minutes. Believe it or not, the modern day smartphone is a private citizen's worst privacy nightmare.

Think about what you have in there: email addresses and phone numbers from your contacts, calendar appointments, photos, and probably even personal financial information. On top of that, the smartphone can continually track your location to build a detailed profile of your whereabouts.

There are multiple ways these devices can send out data and information about their users, which makes them particularly troublesome not only for those who want to remain anonymous, but also for the average Joe. In fact, even if you never use the smartphone to make an actual call, you are already broadcasting information just by the mere act of using the device.

In a recent study conducted by HP, the company discovered that 97% of the tested apps inappropriately accessed private information sources within a device and another 86% lacked the means to protect themselves from common exploits. The good news is that these smartphones allow you to alter many privacy-related settings with a tap or two.

Let's look at the various ways in which you leak private information about yourself via your smartphone – and how you can minimise such broadcasts. We'll also look at tools that allow you to take charge of your privacy and help you communicate without compromising the actual exchange of information.

You are being watched

Prevent apps and services from keeping tabs on you.

Many tasks that were once performed exclusively on PCs have now branched out to phones. They can double as media players, recorders, gaming devices, GPS navigation devices and more. To enjoy all these conveniences you need apps. Unfortunately, apps are the weakest link between your private data and the world. Many access your personal data to 'enhance their experience'. But you must trust that apps will only use this data in a desirable way. Unfortunately, not every app clearly states how they use it and you have no way of knowing if you're safe.

Then there are the free web services. Web companies like Google, Twitter, Facebook and others provide you with a free service in return for information about you. This information is then used to target ads. Some consider this fair trade but privacy campaigners are becoming increasingly concerned.

A critical component of your Android smartphone is the permissions system. When you install an app, it notifies you of what it would like to gain access to. You can then install the app, or not. Unfortunately, this system puts a lot of responsibility on the users to know whether these access requests are appropriate. According to research reports (**tinyurl.com/pngj3ws**) many apps request excessive permissions.

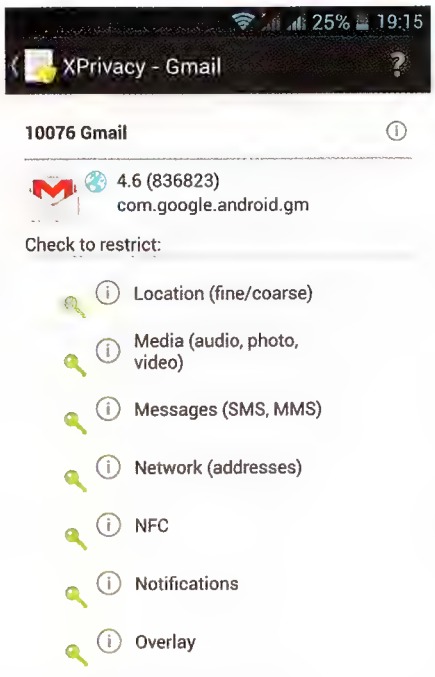
There are multiple ways of visualising app permissions. BitDefender's free Clueful app helps you identify what an app is doing, and what it should be doing. Once installed Clueful will scan your apps and categorise them as High Risk, Moderate Risk, and Low Risk. You can then browse each list and click on an app to find out the feature it can access. You should uninstall any High Risk apps as they might be pinching your passwords or reading emails.

Then there's Malwarebytes' Anti-Malware mobile app which also includes a Privacy Manager. It scans apps and divides them into categories based on the phone feature they have access to, such as Access Calendar and Access Storage. The app will come in handy when you want to know which apps can read personal information like your contact list or web history.

CONTROL PERMISSIONS
Once you've identified a privacy-intruding app you can remove it.

Three degrees of separation

You don't need to be talking to a terror suspect to get the NSA interested in your personal communications. The agency is allowed to travel 'three hops' from its target. So they can monitor the communication of people who talk to people who talk to people who talk to you. This three degrees of separation allows NSA to virtually monitor everyone.



Mastering the learning curve of XPrivacy will go a long way in protecting your privacy.

Google recently let slip a privacy functionality in Android 4.3 that users could unlock with the Aps Ops Launcher tool. With this feature you could selectively turn off privacy-related permissions. For example, you could install the Shazam music recognition app but turn off its ability to track your location. However, Google removed the feature in the following update, much to the chagrin of the EFF. When asked, Google said the feature was experimental and was released by accident.

If you have a rooted Android device you can still get the feature as a module for the Xposed framework. Users of rooted devices can also use the XPrivacy module for Xposed.

With XPrivacy you can control specific permissions for all installed apps. The best bit is that once you disable a particular feature, say, access to contacts, XPrivacy will shield the real data and instead feed a list of bogus contacts to any app that requests them.

In addition to preventing the apps from leaking info, you should also minimise the personal data you put out there, even when sharing something as innocuous as images. John McAfee, who was evading authorities, was ousted in Guatemala thanks to a photo.

Sharing images taken from your smartphone reveal a lot of information about you thanks to the EXIF data attached to them, so if you take an image with a GPS-enabled camera or a smartphone, it can reveal your location, the time it was taken as well as the unique ID of the device.

To strip EXIF information from pictures before sharing them you can use the Instant EXIF Remover app. The app doesn't have an interface. Once installed it'll be available as an option in the Share action. When selected, the app will intercept any images you wish to share and delete all EXIF data, before passing them on to the email client or any other sharing app.

Also, before you upload files to a cloud sharing service like Dropbox or Google Drive, it's a good idea to encrypt them. You can do this easily on a Linux box with EncFS.

EncFS is available in the repositories of popular distros like Fedora and Ubuntu. The tool requires you to create two directories – one that houses your unencrypted content and the other with the encrypted version. The way the tool works is that you interact with the files in the unencrypted folders and they are encrypted on-the-fly in the encrypted folder.

To use EncFS with a cloud sharing service like Dropbox, just make sure you keep the encrypted folder inside the Dropbox folder. This will automatically sync any changes to the encrypted folder to Dropbox. After installing EncFS, create the two folders with encfs ~/Dropbox/.encrypted ~/Private. The tool will ask you questions and create the folders. Any files in the Private directory will now be synced.

Communicate securely

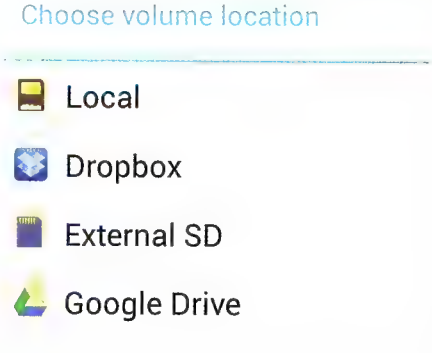
Use your phone in Incognito mode.

The key to securing your phone against any sort of surveillance is end-to-end encryption. There are an increasing number of apps and services that let you encrypt the data on your device before it is sent off and then decrypted at the recipient's device. Encryption doesn't prevent the caching of data but safeguards it against any kind of snooping by making it unintelligible to anyone without the correct decryption keys.

Begin your lockdown efforts by obfuscating your web browsing activities. Just like any desktop web browser, you can install a variety of add-ons to your Android browser.

Some of the popular Privacy-inducing add-ons are the Phony add-on which you can use to customise the user-agent on the browser and hide the fact that you are on a mobile device. Then there's the self-destructing cookies add-on which will automatically delete all cookies when you close a site. For more comprehensive control you can use the CleanQuit add-on which removes all information about the previous session including the browsing and download history and site preferences.

If you want anonymity, you should switch to the Orweb browser (**tinyurl.com/74os7yl**) which is preconfigured to help you browse the web anonymously. It's also loaded with plugins to disguise your device, gives you control over cookies, prevents loading of Flash content and keeps no browsing history. It requires the Orbot plugin, and Orbot is Tor for Android.



The EncDroid Android app lets you create EncFS encrypted folders and syncs them.

On initial launch, Orbot runs through a quick setup wizard. If you have a rooted phone, you can turn on transparent proxying, which allows all network apps to automatically run through the Tor network.

To sign and encrypt email messages on your mobile device you need the Android Privacy Guard (APG) app, which is an open source implementation of OpenPGP. You'll also need the K-9 email app, which integrates seamlessly with APG.

To use these apps, first launch K-9 and configure it to connect to your email server. Then launch APG and tap the menu button, which brings up the option to manage private keys and public keys. You can export these keys from the desktop and import them into APG. Once the keys are imported, K-9 will display the option to sign and encrypt messages when you write a new email. Conversely it will let you decrypt emails when you receive a new encrypted message.

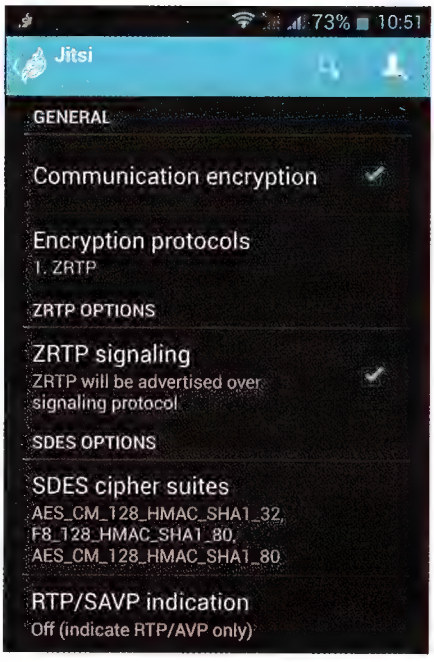
Similarly, if you wish to encrypt instant messages, you'll need the open source ChatSecure app. The app uses the OTR protocol to enable secure chat sessions over XMPP accounts. Using the app you can have secure chats with your friends over popular networks including Google Talk and Facebook on any OTR compatible client including Pidgin, Adium, and Jitsi.

OLD SCHOOL USAGE

Another famed form of text-based communication is SMS. Although on a steady decline due to the falling prices of mobile internet many people still use texting as their primary means of communication.

You can encrypt SMS messages with the open source TextSecure app, which can encrypt SMS stored locally on the phone. However, to send encrypted messages over the air, the recipient must also have TextSecure or they'll receive unencrypted messages. When you run the app first time, it gives you the option to create encrypted versions of all local messages. Although it doesn't touch the existing unencrypted SMS, it's advisable to delete them after creating encrypted versions.

Before you can send messages you'll have to create a secure connection



You can use the Jitsi app for making encrypted video calls.

with the recipient's device by exchanging keys. TextSecure will send a message to the recipient, whose TextSecure app will automatically respond with a message to establish a secure connection. From then on you send and receive encrypted messages.

Surprisingly, a lot of us still use the smartphone to make actual calls and there are apps and services that will establish secure channels to thwart any attempts to intercept your conversation.

You can use the free RedPhone app, which makes encrypted calls over the internet. There's also SilentPhone, which is developed by Phil Zimmerman who gave us OpenPGP for securing email and ZRTP protocol for securing VoIP calls. The SilentPhone app works on multiple mobile platforms but comes with a $10 subscription fee.

Both these solutions work as advertised and create encrypted calls. However, their major limitation is that they require the person at the other end of the line to be using the same app. The Ostel project is working on solving this problem. They've created a standard known as Open Source Telephony Network (OSTN) that uses free and open source protocols to create end-to-end encrypted voice communication channels.

The best thing about this is that you can connect with any user that's using an app that supports the OSTN standard. There's the CSipSimple app for Android, Acrobits for iPhone users, PrivateGSM for BlackBerry users and the cross-platform Jitsi desktop app for Linux, Windows and Mac users.

Secure your device

Batten down the ports and hatches.

In addition to restricting the flow of data to third-party apps and encrypting all forms of communication, you'll also need to protect against physical compromise. Securing the device safeguards it against the most common fears – theft and unauthorised access.

Privacy conscious users should enable and use one of the several options to lock the phone. You can restrict access via a pattern, a numerical pin, an alpha-numeric password, or a voice command. If you are using a lock screen you should also disable any lock screen widgets. Disabling lock screen widgets required third-party apps like Lockscreen Policy, but is now built into the latest version of Android.

Locking the phone is one thing, but it wouldn't help when you hand over an unlocked phone to someone. You can use Screen Locker (**tinyurl.com/l6s8rrv**) to lock your screen before handing the phone to someone else. The app disables all forms of inputs and prevents the users from viewing anything other than what's on the screen. You can then enter a preset pattern to unlock the device.

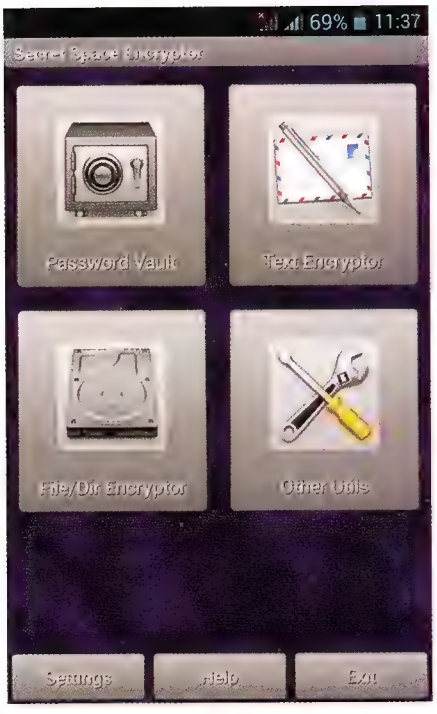
Then there are apps which will lock access to an app with a password. One such is Privacy Master Free, which can also fake a crash to prevent an app from launching, and prevent access to key areas such as the Google Play Store. You can also block the task manager as well as USB connections.

Then there's the AppLock app which, along with the ability to block access to apps, also has two separate vaults where you can hide photos and videos. The app can also prevent toggling of settings such as Wi-Fi. One of the best features is its ability to create lock profiles. So you can create a list of apps you want to lock when you in the office, and another set when you're with naughty nephews. You can trigger the locks based on time or location.

On the security side, the app can randomly rearrange its numeric keyboard to prevent others from figuring out your password by following your fingers. It also allows you to hide the app from the application drawer to keep its existence on your device a secret.

ENCRYPT YOUR DEVICE

Finally, privacy minded users should encrypt the data on their phone using the built-in feature. However, there are some caveats involved with the process. For one, encryption is a one-way process, which is to say that once turned on there's no mechanism to turn off the encryption. You'll have to factory reset your phone and lose all of your data. Also, make sure you back up your data before initiating the encryption process and don't interrupt the process. If you do you'll sure lose the data and render the device unusable.



In addition to encryption, SSE can also securely delete files to remove all danger.

Before you begin, make sure you have set up a lock screen PIN or password, which is required because Android will use it as your decryption key. To begin encryption, head to 'System Settings > Security > Encrypt device'. When it's done you'll have to enter the PIN or password each time you boot your phone.

Instead of encrypting the whole device, you can also choose to encrypt selected files. One of the best apps for this purpose is SSE Universal Encryption. The app offers all the popular encryption algorithms including AES-256, Serpent-256 and Blowfish-256, and has three modules: the Password Vault module allows you to safely store passwords and organise them into folders. The Message Encryptor module encrypts snippets of text. But the most interesting option is the File/Dir Encryptor module. It lets you pick a file using the built-in file browser and then encrypts it.

Installing CyanogenMod does require some doing, but if you can borrow a Windows machine you can save yourself effort via the CyanogenMod Installer at **tinyurl.com/mgdulty**. Free software enthusiasts would want to check out the Replicant distribution. It's based on CyanogenMod and replaces all proprietary Android components with their free software alternatives. Phil Zimmermann's Silent Circle has tied up with the Spanish Geeksphone handset manufacturer and is about to launch the Blackphone for the privacy conscious. The phone will run the PrivatOS distribution. ■

Switch to a third-party firmware

Every year Google offers a vanilla Android operating system popularly known as AOSP for download. Many developers take this version and work on it to develop their own customised version of Android.

CyanogenMod is one such Android distribution and also one of the most popular, with millions of users. One reason for its popularity is that it gives you complete control over your device and frees it from any ties to Google, your network or the phone's manufacturer. It's also worth mentioning that the CyanogenMod team is quick to patch security holes and fix bugs that were only fixed by Google in the next Android release. The third-party firmware also includes the Privacy Guard app which gives you better control over apps and their permissions.

The newer versions of the app also include the AppOps feature, redacted by Google in Android 4.3. With this feature users can prevent individual apps for accessing your data. The latest version of CyanogenMod also integrates the secure SMS app TextSecure in the firmware itself.

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THE ULTIMATE DISASTER RECOVERY GUIDE

Can't get into Windows? Don't panic. We have the tools and advice you need to get your PC working again.

One of the most frightening moments for any Windows user is suddenly finding that your PC won't boot. You might get lucky, and the issue will be something that Windows' own repair tools can easily fix, but it could be something much worse. If the latter is the case, you may end up locked out of your PC, programs and precious files. Whether it's a relatively simple issue such as a corrupt file or something as potentially devastating as a malware infection or failing hardware, you'll find yourself unable to even boot into Safe mode, leaving you in a precarious position.

In this feature, we'll reveal how you can arm yourself with a couple of rescue discs or USB flash drives, which will give you access to your computer when Windows won't boot. These will simultaneously provide you with an easy-to-navigate user interface and an array of tools to find your secure, data, remove malware and hopefully diagnose and fix problems. The tools will work on all PCs from Windows 8 down to Windows 8 [illegible] though there may be some [illegible] will [illegible] you [illegible] these. We'll not only show you how to build [illegible] media, but we'll also reveal how to [illegible] of malware infections and [illegible] whatever happens [illegible] repair or reinstall [illegible] you won't lose all of your [illegible] halved photos and [illegible] files.

We'll [illegible] by highlighting some of the best tools for helping you diagnose whatever problems are [illegible] your PC and [illegible] guiding you towards a fix. We'll also point you in the direction of some additional tools available [illegible] that you can download and use [illegible] and you need a bit more help. With a bit of [illegible], you'll get your PC working again, and even if you don't [illegible] have recovered whatever data needs recovering.

Build and test your rescue disc

The first thing you need to do is create your rescue media. The most critical tool in your armoury is the Hiren's BootCD, which contains almost everything you need, including access to a Windows-like environment, the ability to get online and browse the internet for help, and a collection of useful tools to help you get started. Should Windows ever fail to boot, all you need to do is insert this disc or pop in the USB flash drive and you're good to go.

Obviously, the best time to build your repair disc is while your computer is working properly. If it's not, then you'll need access to another PC running Windows XP or later, with a broadband connection and a DVD burner or spare USB 2.0 port. We recommend you create two copies of your bootable media – one should be a CD and one should be a USB flash drive. While USB flash drives boot faster and can be easily customised with additional tools, some older PCs are unable to recognise them as bootable media. Therefore, it makes sense to have one of each available.

BUILD YOUR DISC

Firstly, you'll need to download the files you need to create the Hiren's BootCD. Go to **www.hirensbootcd.org/download** and scroll down past all the download links until you see one marked 'Filename: Hirens.BootCD.15.2.zip'. Click it to start the download. Note the file size – at 592MB, its download time can vary from less than three minutes on a fast 30Mbps connection to well over an hour on a slow 1Mbps one, so you might want to consider backing up the file once you're done.

Once saved to your Downloads folder, right-click 'Hirens.BootCD.15.2.zip' and choose 'Extract All'. Leave the default destination selected and click Extract. Once complete, a new Hirens.BootCD.15.2 folder will appear. Inside the folder you'll find a BurnCDCC.exe program for burning the rescue disc. Double-click this, then click Browse to select the Hirens.BootCD.15.2.iso file from the same directory. Pop in a blank CD or DVD, then tick 'Read Verify' before clicking Start. The bootable disc will now be created.

Once your copy has been burned and verified, remove it from the drive, label it and keep it in a safe place. Now follow the step-by-step guide below to create your bootable USB flash drive. Be aware that the flash drive needs to be at least 1GB in size and any existing data on it will be lost.

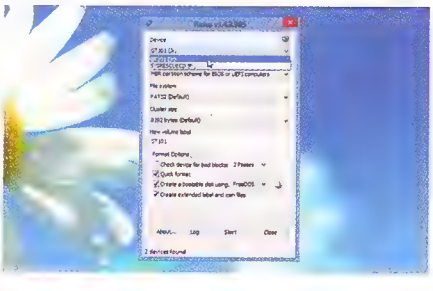
Once the Hiren's BootCD and/or flash drive has been created, it's important to test that it works correctly. Leave the CD or flash drive inserted and then restart your PC. Look for a message on boot-up that allows you to access a boot menu or boot options – this is often the F11 key. Tap this until you see the boot menu appear, then select either your CD drive or USB flash drive from the list and press Enter.

You should see the Hiren's BootCD menu appear. From here, use the cursor keys to select the 'Mini Windows XP' option and press Enter. After a short pause, you'll see the Windows XP logo and will eventually find yourself in the main Mini XP interface, which is based on XP itself. From here it is possible to safely shut down the computer in the usual way, then reboot back into Windows proper. If the BootCD menu appears again, leave 'Boot from hard drive' selected and press Enter.

TROUBLESHOOT

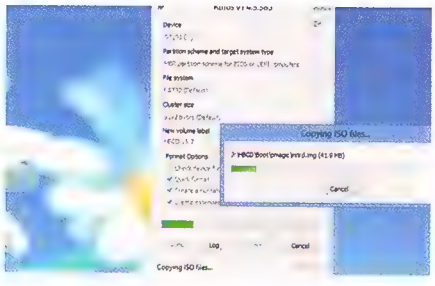
If you are unable to access a boot menu and your computer doesn't automatically detect your Hiren's boot media, you'll go straight back into Windows. If you're running an older PC, it is possible that it just doesn't support booting from USB devices. If this is the case, repeat the test with your bootable CD instead. If this doesn't work either, or you believe your machine should support USB booting, restart again. However, this time tap the key prompted – typically Del or F2 – to enter your PC's BIOS setup. Look for a Boot section where you can set the boot device priority, and make sure that your CD drive or USB drive is placed higher up the list than your hard drive. Save your changes and try again. In newer PCs you may have an issue with

Create a USB rescue disk



1 FIRST STEPS
Download Rufus from **http://rufus.akeo.ie** – once downloaded, make sure that your USB flash drive is plugged in and double-click the file to launch the program, clicking Yes when prompted. First, select your drive under Device.

2 MAKE BOOTABLE
Make sure 'MBR partition scheme for BIOS or UEFI computers' is selected, then set the File system to 'FAT32'. Under 'Format options', select 'Create a bootable disk using', choose 'ISO Image' and click on the image of a disc.



3 CREATE DISK
Browse for and select the Hirens.BootCD.15.2.iso file, then click Open. Finally, click the Start button and wait while the disk is made bootable and the ISO file's contents are transferred across.

Secure Boot. If your PC came with Windows 8 pre-installed, for example, Secure Boot is likely to be enabled, which prevents you by default from booting from anything other than the internal hard drive. If this is the case, enter your PC's UEFI setup utility at start-up and look for an option to set it to 'Disabled'. Once done, you should be able to access the boot menu along with the Hiren's rescue media.

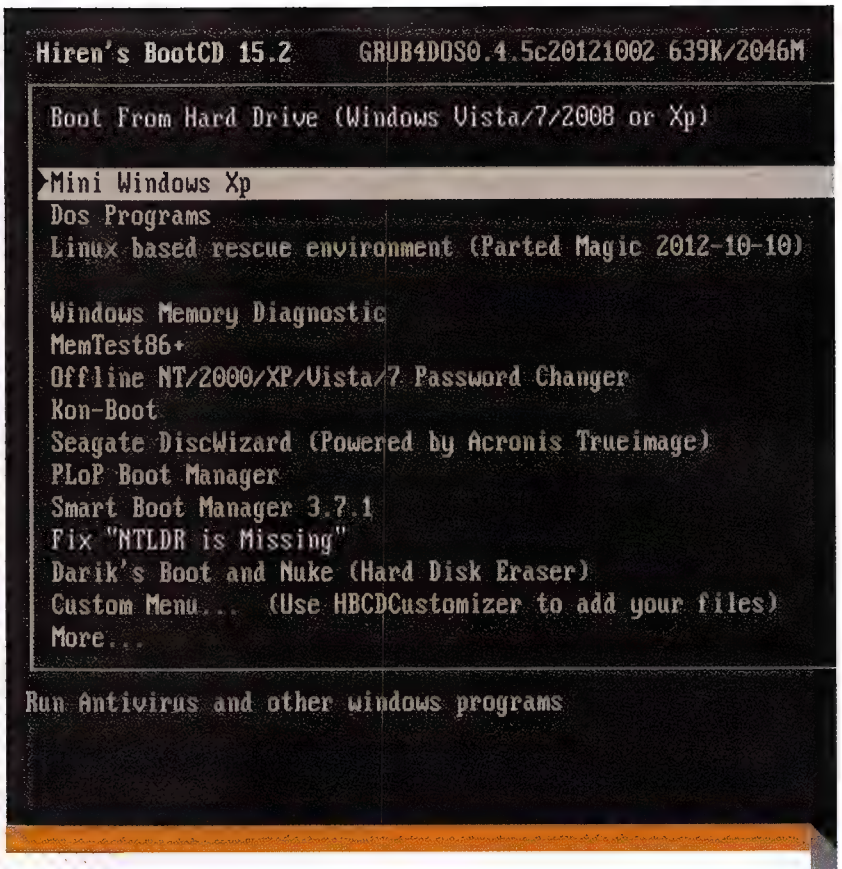
If your PC has newer SATA hard drives, you may find they are inaccessible in Hiren's BootCD. That's because XP can't see these types of drive. See page 74 for a guide to fixing this issue, which may result in your PC freezing when the desktop first appears.

ELIMINATE ISSUES

Even if you successfully manage to load Mini Windows XP, you may come across other issues that need resolving. If the screen appears a little cramped, right-click the desktop and choose 'Properties > Settings' and then push the slider up a notch or two before clicking OK. You'll also notice Network Setup and Wireless Setup shortcuts – you'll need one of these in order to access the internet should you need it. Again, you may run into problems with newer PCs if the card isn't recognised – see the step-by-step guide for a workaround.

You may find your wireless mouse and keyboard don't work after you've booted into Mini Windows XP. If this happens you'll need to source wired alternatives, or check the BIOS for USB compatibility settings.

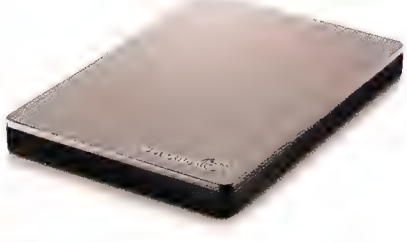
Once your rescue media has been created and tested, label it and keep it in a safe place until it's required. Simply turn the page to find out how you can use it to disinfect your computer, recover data and repair your Windows installation.


Hiren's BootCD 15.2 GRUB4DOS0.4.5c20121002 639K/2046M
Boot From Hard Drive (Windows Vista/7/2008 or Xp)
Mini Windows Xp
Dos Programs
Linux based rescue environment (Parted Magic 2012-10-10)
Windows Memory Diagnostic
MemTest86+
Offline NT/2000/XP/Vista/7 Password Changer
Kon-Boot
Seagate DiscWizard (Powered by Acronis Trueimage)
PLoP Boot Manager
Smart Boot Manager 3.7.1
Fix "NTLDR is Missing"
Darik's Boot and Nuke (Hard Disk Eraser)
Custom Menu... (Use HBCDCustomizer to add your files)
More...
Run Antivirus and other windows programs

Add more repair tools

Hiren's BootCD comes with lots of useful tools to help troubleshoot your problems, but you can also add other portable applications if you prefer — most should work in the Mini Windows XP environment as long as they are XP-compatible. Adding these to your Hiren's USB flash drive is as simple as creating a suitable folder — say PortableApps — on the drive after you've created it and copying files to that. Advanced users can use the HBCDCustomizer.exe program in the Hirens.BootCD.15.2 folder to extract the ISO file to a folder. They can then add their own apps to this folder and create a new ISO file to burn to CD. Alternatively, you could simply put all of your apps on another USB flash drive, and plug that in when you're running Mini Windows XP.

Essential add-ons



1 BACK-UP DRIVE

Data recovery and imaging your hard drive in its current state require a back-up drive. A 32GB or 64GB flash drive might be sufficient in some circumstances, but a USB hard drive is probably the best solution for the majority of PC users.

2 NETWORK FALLBACK

If your network devices aren't detected in Mini Windows XP, consider fitting an older Wi-Fi or network adaptor (internal or USB) that is known to work in Windows XP, then test it to verify that it works in Mini Windows XP.

3 ANTI-MALWARE CD

Over the page, we'll show you how to create a Kaspersky Rescue Disk. Check your own security software's web site for a downloadable rescue disc for burning to CD or putting on to a USB flash drive as an alternative.

Disinfect a malware-infested PC

The gloves have always been off in the battle between malware and security. If a malware infection manages to take full hold of your PC, it can easily make it impossible for you to remove it from within Windows itself. Even Safe mode – where malware used to be crippled – is no longer a haven. And that's assuming the malware infection hasn't barred you from accessing it in the first place.

Removing all traces of an infection can be a struggle. Malware could lock you out of important parts of your computer while your security software lies crippled in the background. At times like these, the solution is to press your recovery media into action. However, despite the fact that Hiren's BootCD comes with a number of antivirus tools on board, its age means that many are outdated and therefore won't work correctly.

Thankfully – as the step-by-step guide reveals – you should be able to use your rescue media to boot into Mini Windows XP, then download and create a Kaspersky Rescue USB drive. This is up to date and contains pretty much all the tools you need for rooting out and disinfecting your PC.

WORKAROUNDS

The Kaspersky Rescue Disk produces good results, but if you're unable to create one for whatever reason, then you can still make use of a couple of tools on the Hiren's BootCD.

Boot into Mini Windows XP, then double-click the '1,024 x 768' shortcut to increase the screen resolution before double-clicking either the 'Network' (for wired connections) or 'Wireless Network' shortcut to get on to the internet.

Once done, open Hiren's Program Launcher via its System Tray icon, expand the 'AntiVirus/Spyware' section and choose 'Malwarebytes Anti-Malware'. Switch to the Update tab to check and download the latest update, then switch back to the Scanner tab and perform a full disk scan. Don't assume all the scan results are malware: any references to your B or X drives and Registry will be false-positives. All other results are indicative of malware, so make sure they're ticked and click 'Remove Selected'.

If you'd like a second opinion, select 'ClamWin Free Antivirus' from the same menu. A command window will open with a list of options: Press 2 to update the definitions before opening the main program. Hold Ctrl and click on your local hard drive letters to select them. If you need help identifying them, click 'Start > Programs > Windows Explorer'. Leave drives B, X and your CD drive unselected, then click Scan.

ClamWin scans for any lingering malware, but will not remove it. If it finds any, open 'Tools > Preferences > General' and select Remove, then repeat the scan. This could end up deleting key system files, so use with care.

Check out the box below for additional steps to follow should you find that certain parts of your system are still inaccessible even after the infections have all been removed.

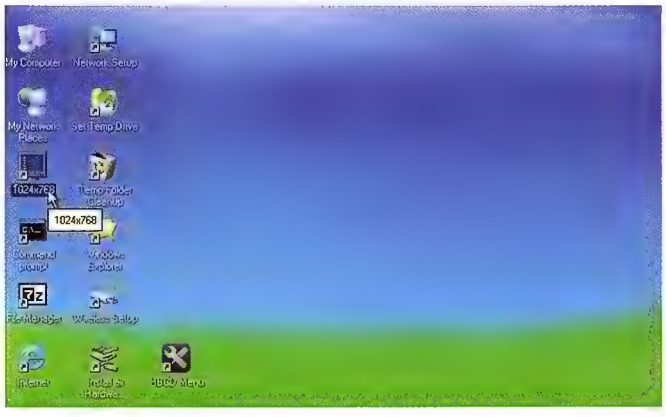
Malwarebytes Anti-Malware
Malwarebytes Anti-Malware
Scanner | Protection | Update | Quarantine | Logs | Ignore List | Settings | More Tools | About
Scanner
Below is a list of malicious software found on your system. Close all unnecessary applications to ensure success
Vendor | Category | Item | Other
Adware.HotBa... | Registry Key | HKCR\CLSID\{B6856926-5386-468F-B37D-6...
Adware.HotBa... | Registry Key | HKCR\Smart-Shopper2.IEButton.1
Adware.HotBa... | Registry Key | HKCR\Smart-Shopper2.IEButton
Adware.HotBa... | Registry Key | HKCR\Typelib\{75D461CC-D850-41DD-B62...
Adware.HotBa... | Registry Key | HKCR\Interface\{1277A995-C3E9-4EA1-897...
Adware.HotBa... | Registry Key | HKCR\Typelib\{8346A35D-E391-4C1E-82F8-...
Adware.HotBa... | Registry Key | HKLM\SOFTWARE\Microsoft\Internet Explor...
Adware.HotBa... | Registry Key | HKLM\SOFTWARE\Microsoft\Internet Explor...
Rogue.Installer | File | C:\Program Files (x86)\Registry Helper\uninst....
Rogue.Installer | Registry Key | HKLM\SOFTWARE\Microsoft\Windows\Curr...
Adware.HotBa... | File | C:\Program Files (x86)\Smart-Shopper2\Unins...
Adware.HotBa... | Registry Key | HKLM\SOFTWARE\Microsoft\Windows\Curr...
Adware.Hotbar | File | C:\Users\Advent\AppData\Local\Google\Ch...
Rogue.Installer | File | C:\Users\Advent\Downloads\RegistryHelper...
Adware.Hotbar | File | C:\Users\Advent\Downloads\SmartShopperS...
Remove Selected
Ignore
Save Log

Post-disinfection steps

The infection has gone, but after booting back into Windows you may find that you're still unable to access key parts of your system, such as Registry Editor, the Run dialog box or various system tools. Don't panic — visit **www.tweaking.com** in your web browser, click on 'Tweaking.com – Windows Repair' and download the portable version. Once extracted, double-click the program and work your way through the initial steps to repair damaged or missing system files and to back up the Registry.

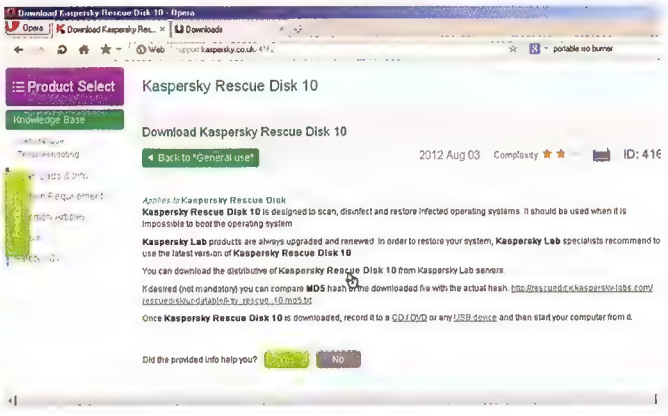
When you come to the 'Start Repairs' section, you'll see a list of 28 repair categories, many of which cover damage from malware infection. Click one for a more detailed description, then tick those that you think will help you regain control of your PC, such as 'Remove Policies Set By Infections' and 'Repair Windows Safe Mode'. Click Start to hopefully finish the job of repairing your PC. You'll need to reboot when the repairs are complete; once this is done you will be able to test to see if you are able to access key parts of your system again.

Scan and remove malware with Kaspersky



1 CONNECT TO INTERNET

Boot to the Mini Windows XP environment using the Hiren's rescue media. First double-click '1024 x 768' to make the screen bigger. Now double-click the internet shortcut on the desktop — this will initialise your network connection and then load the Opera web browser, allowing you to download the files you need.


Product Select
Kaspersky Rescue Disk 10
Knowledge Base
Download Kaspersky Rescue Disk 10
Back to "General use"
2012 Aug 03
Complexity
ID: 416
Applies to Kaspersky Rescue Disk
Kaspersky Rescue Disk 10 is designed to scan, disinfect and restore infected operating systems. It should be used when it is impossible to boot the operating system
Kaspersky Lab products are always upgraded and renewed. In order to restore your system, Kaspersky Lab specialists recommend to use the latest version of Kaspersky Rescue Disk 10
You can download the distributive of Kaspersky Rescue Disk 10 from Kaspersky Lab servers.
If desired (not mandatory) you can compare MD5 hash of the downloaded file with the actual hash: http://rescuedisk.kaspersky-labs.com/rescuedisk/updatable/kav_rescue_10.md5.txt
Once Kaspersky Rescue Disk 10 is downloaded, record it to a CD / DVD or any USB device and then start your computer from it.
Did the provided info help you?
Yes
No

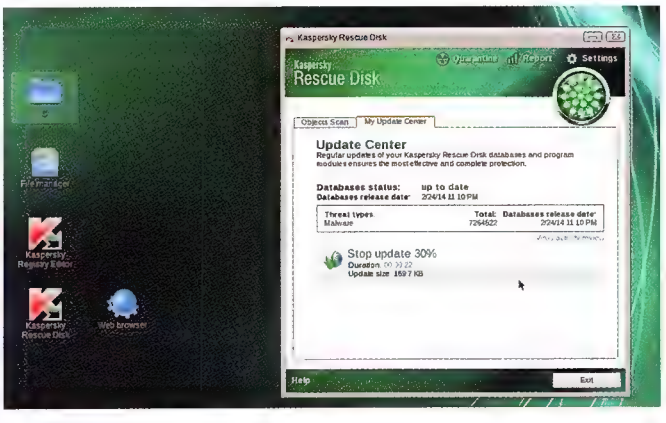
2 GET FILES

First, browse to **support.kaspersky.com/4162** and click the 'Kaspersky Rescue Disk 10' link. Save the ISO file – all 388MB of it — to your B drive. Next, go to **support.kaspersky.com/8092** and download the utility for creating a bootable Kaspersky Rescue Disk to the same drive.

Welcome to Kaspersky USB Rescue Disk Maker!
This utility is designed for recording the Rescue Disk on USB media
Path to the Kaspersky Rescue Disk image (.iso):
B:\kav_rescue_10.iso
Browse...
USB medium:
H:\ (SMI USB DISK) (478.0 MB)
Recording
STOP

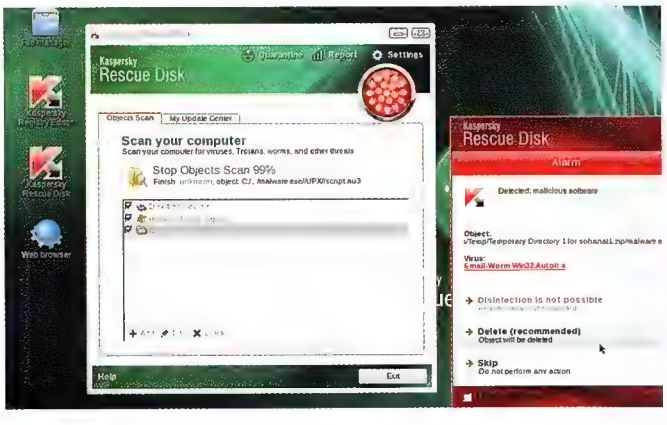
3 CREATE USB DISK

Plug in a USB flash drive with a minimum capacity of 512MB. You'll lose all existing data on it, so make sure vital files are saved elsewhere. Double-click the downloaded rescue2usb.exe file to launch the utility. Click Install, click Browse to pick the kav_rescue_10.iso file from drive B. Click Start to create the rescue media.



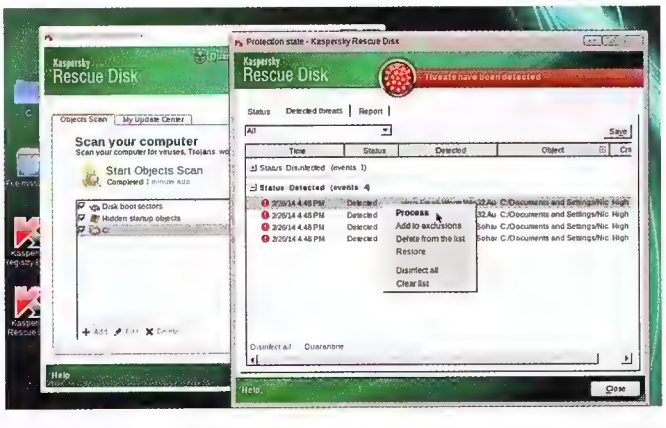
4 BOOT INTO KASPERSKY

Remove the Hiren's media, then restart your PC with the Kaspersky drive inserted. Press any key when prompted, then hit Enter followed by 1 to accept the user agreement. Next, select the 'Graphical Mode' option. When the main screen appears, go to the 'My Update Center' tab and click 'Start Update'.



5 SCAN AND DISINFECT

Go to the 'Objects Scan' tab. Make sure all options are ticked, then click 'Start Objects Scan'. Wait while your computer is scanned. As threats are found, alerts will appear to let you know. Choose the recommended option when prompted — typically Disinfect or Delete — and tick 'Apply to all objects' to speed up the scan.



6 FINAL STEPS

When the scan is complete, click the Report button for a complete list of detected objects. Switch to the 'Detected threats' tab and expand the Detected section if it exists. These threats need to be fixed manually — right-click and choose Process, then delete the threats when prompted. Once complete, click Close.

Recover documents and other data

If your PC fails to boot, the cause could be anything from a corrupt update to the after effects of a malware infection. The tools on the previous page can remove malware from outside Windows, but 'Tweaking.com – Windows Repair' only works in Windows itself. Therefore if you are still unable to boot into Windows (or your problem isn't to do with an infection), you'll need to press your Hiren's rescue media into action to undo the damage.

Before trying to diagnose and fix whatever problem ails your PC, you should safeguard your data. In the worst case scenario you can reinstall programs and Windows easily enough, but personal documents, photos and other data can't be recreated so easily. You might be one of those users who diligently backs up files and folders regularly, or stores them on a different hard drive or partition to Windows itself. Nonetheless, it is critical to know whether or not your files survived whatever's happened to your computer while carrying out your troubleshooting process.

Start by booting from your Hiren's rescue media. If your PC is a newer model with SATA hard drives, Hiren's may not detect them. If the drives don't show up in Mini Windows XP when you double-click 'My Computer', or the OS freezes before launch with no access to the mouse or keyboard, restart your PC and tap the key prompted to enter the 'Setup, BIOS or UEFI utility'. Explore the various sections looking for a reference to storage. Select this and check to see what mode your hard drives are in; if it's set to 'AHCI', Hiren's will be unable to access your drives. Switch this to 'IDE' for compatibility purposes, but switch back to 'AHCI' before you next boot into Windows.

FIND FILES

Once at the desktop, double-click '1024 x 768' to resize your desktop, then open 'My Computer'. From here, you should be able to see all the drives currently connected to your PC, and browse them as if you were in Windows itself. One of these drives should be your back-up drive – this is where you'll recover any files before attempting further repairs on Windows itself. If you only need to recover a few files, double-click 'My Computer' again to open a second window, pointing towards a folder on your back-up drive, such as 'Recovered'. Browse to the folders containing your personal data – unless you've manually switched these to another drive or partition, you'll need to browse to C:\Users (Windows Vista or later) or C:\Documents and Settings. Here you'll find all the personal user folders on your PC – if in doubt about what needs recovering, simply copy the entire folder across to your back-up drive if there's space to house it all. Otherwise, open each user folder in turn and browse the My Documents folder (Windows XP) or Documents, Pictures, Videos and Music folders.

TAKE A BACKUP

Another way to rescue files that are still present and visible is to back them up. Click the 'Program Launcher' button and you will see a Backup section. There are no convenient file-based back-up tools provided here; see the step-by-step guide opposite for a free alternative called Toucan, which you can download and run from within Mini Windows XP. Advanced users can experiment with the Rules, Variables and Script tabs as well as compression settings if space is tight on the back-up drive.

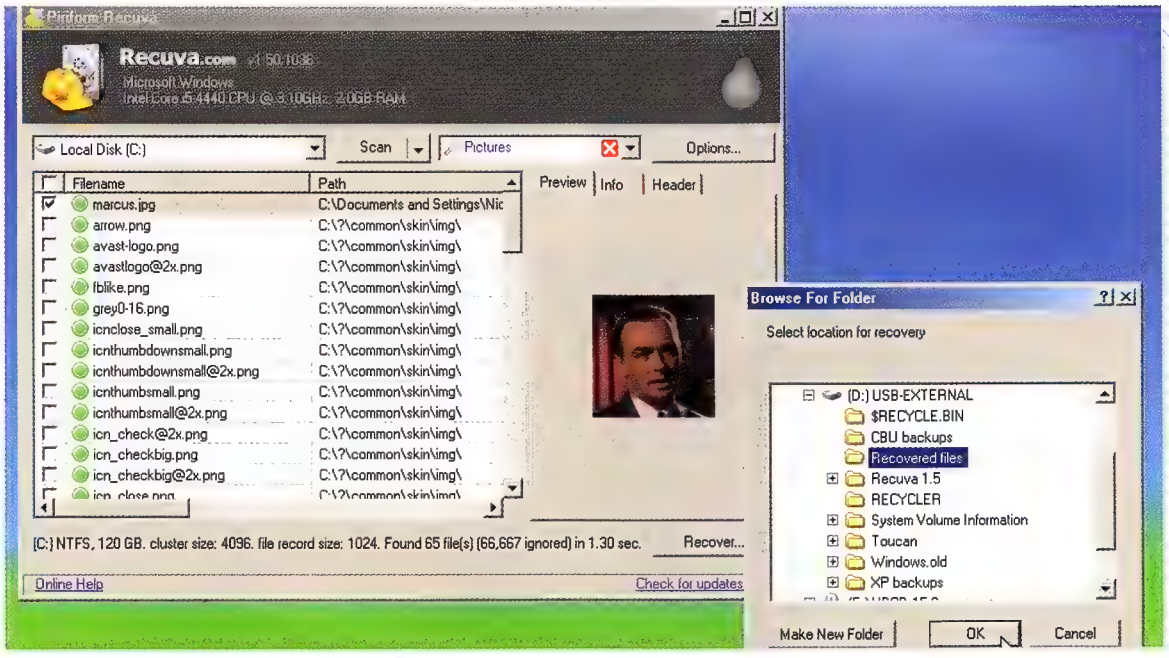
In the Program Launcher's Backup section there are a number of very useful drive-imaging tools. These enable you to take an exact copy of your Windows hard drive as it currently stands, giving you a failsafe backup to fall back on should your repairs prove disastrous.

Our personal favourite among the tools on offer is Macrium Reflect – the version here is a little outdated, but it's easy to use. Just click 'Create an Image', then follow the wizard through, selecting your main hard drive in the Partition selection screen, then choose a folder on your back-up drive when asked for a destination. Prior to

Dude, where's my drive?

What happens if your drive isn't detected in Mini Windows XP even after it's been set to IDE mode in the BIOS? Firstly, verify that the drive has been physically detected by Mini Windows XP. Do this by opening Program Launcher and selecting 'Testing > HDD Scan' to perform various tests on it to make sure that it is physically sound.

If it's sound but no partitions are showing, open the Program Launcher and select 'Partition Wizard Home Edition'. Ignore the prompt for a new version, select the empty drive and click 'Partition Recovery Wizard', then follow the prompts to restore the lost partition. When the wizard closes, right-click the recovered partition and choose 'Change Letter' to assign it drive C, then click Apply to complete the recovery.



Recuva may help you track down lost or deleted data on your drive.

clicking Finish to create the image, click 'Advanced > Auto Verify Image' and tick 'Verify image or backup file directly after creation' to ensure the backup is sound.

If there is plenty of space left on your back-up drive, consider taking a 'forensic' image of the drive instead. This ensures any previously deleted or lost data is backed up with the actual files you can see. It means you can postpone data recovery in order to try to repair or reinstall Windows itself, or it gives you a failsafe backup to fall back on should your data recovery efforts go awry.

To create such an image, just follow the previous steps, but click Advanced and select 'Make an exact copy (clone) of the partition(s)' before clicking OK followed by Finish.

When you need to, you can restore the entire image, getting back everything you backed up, from within the version of Macrium on your Hiren's rescue media – click 'Restore an Image'.

RECUVA IT!

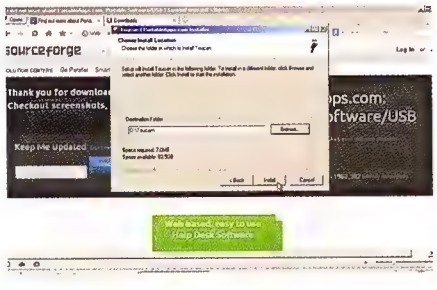
Don't worry if the files you need to recover appear to be missing, even when the drives and partitions are accessible. The Hiren's BootCD ships with a wide range of data recovery tools, including one of our favourites: Recuva. This version is a little out of date, but is perfectly functional – it may be able to help you recover your data.

Alternatively, open the web browser and download the latest portable version of Recuva from **www.piriform.com/recuva/builds**. Opt to open the file directly, then when 7z File Manager opens, select the zip file (called rcsetup150.zip at the time of writing) and click Extract. Choose a folder on your back-up drive and click OK. Once extracted, navigate to the folder and then double-click 'recuva.exe'. After a lengthy pause it should open. You can then search for files using the wizard, or click on Cancel to manually search using the main program interface. Recuva will then help you to find any traces of your missing files. Make sure that you save any recovered files to your back-up drive.

Visit **www.piriform.com/docs/recuva** for a more detailed online user guide.

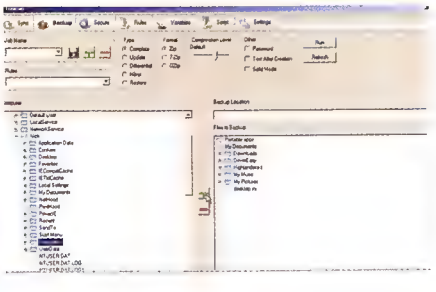
If Recuva doesn't find what you're looking for, you will find a number of alternative data recovery tools in the same location as Recuva. Just go to 'Program Launcher > Recovery'.

Back up with Toucan



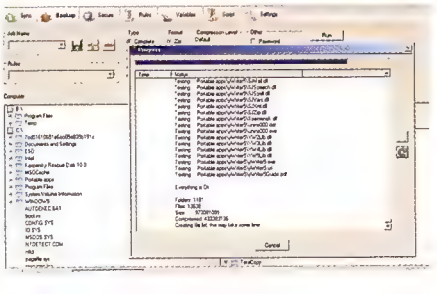
1 INSTALL TOUCAN

Open the browser and go to **portableapps.com/toucan**. Click 'Download Now', then choose Run to open the installer. Click 'OK > Next', select your back-up drive and click Install. Tick 'Run Toucan' and then click Finish.



2 CREATE BACK-UP JOB

Switch to the Backup tab and select a folder or file to back up in the Computer pane. Click on the '+' button to add the file or folder to the 'Files to Backup' list. Repeat for any other folders that you wish to add to the backup.



3 SET DESTINATION

Click the '...' button under Backup Location to select a folder on your back-up drive. Give it a suitable name under File name — such as Recovered — before clicking Save. Finally, tick 'Test After Creation' and then click Run.

Diagnosis and repair tools

CHECK DISK

Are you suspicious that a corrupt hard drive may be preventing you from booting Windows? Click Start, select 'Programs' and click 'Check Disk'. A command window opens listing all attached drives and their letters. Type in the letter associated with your hard drive (typically C) and hit Enter.

If Check Disk doesn't find and fix anything, extend your tests via the 'Program Launcher > HD Disk/Storage' menu. Use HD Tune's Health tab to quickly highlight any potential physical problems, then switch to the 'Error Scan' tab to see what blocks – if any – have been damaged. Other tools worth trying include HD Scan (Low Level Diagnostic). Launch the program, then click on the Scan button. This enables you to select from a wide range of tests in order to give your hard drive a good checking over.

ACCESS LOCKED FILES

You should have no problems using the Mini Windows XP environment, but you may find yourself locked out of a folder. To unlock it, run NTFS Access 2.2 from 'Program Launcher > FileSystem'. Select the folder that you want to recover, then untick 'Set folder owner' before clicking Grant. This gives all users access, which enables you to recover it now, or access it when you next boot into Windows proper.

However, this technique comes at a cost to security. Therefore, advanced users could simply right-click the folder itself and choose 'Properties > Security' to set permissions manually. Less confident users should stick with using the NTFS Access option.

ALTERNATIVE PARTITION RECOVERY

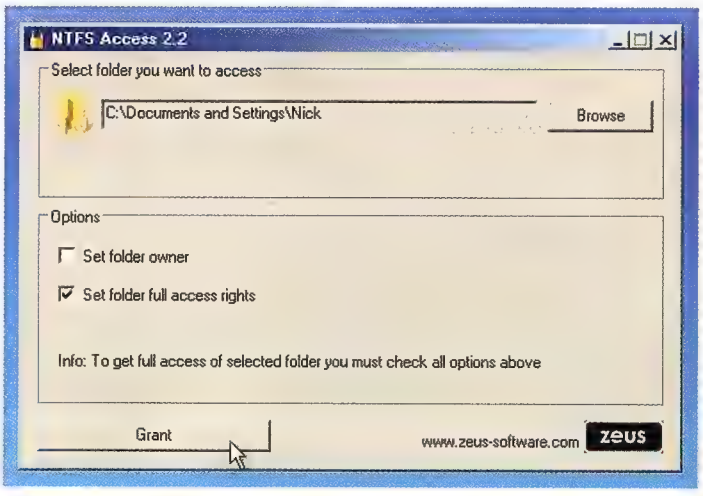
Partition Wizard Home Edition may be unable to restore any missing partitions. Open 'Partition Find & Mount' from the 'Program Launcher > Partition/Boot/MBR' menu, select your drive and click Scan. Start with the 'Intellectual Scan', then 'Normal' and 'Thorough' until the drive appears under 'Found partitions'. You can't restore it from here, but you can recover data. Choose 'Mount As' to mount it as a drive in Windows; this enables you to copy files or take a full drive image with Macrium.

REGISTRY EDITOR PE

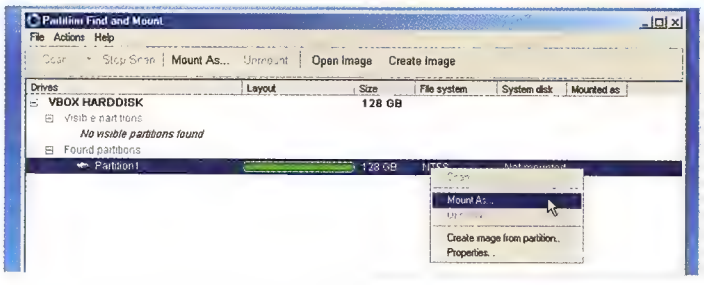
You will need Registry Editor PE if you can't boot into Windows because of a Registry problem. It enables you to load your Registry settings into Mini Windows XP's Registry Editor and make changes from there.

While in Mini Windows XP, go to 'Program Launcher > Registry', and launch Registry Editor PE. Simply click Open each time that you are prompted for a hive (SAM, SECURITY, Software and finally System). If you need to make changes to the HKEY_CURRENT_USER part of your Registry, click Yes and then browse to your own personal user folder under C:\Users or C:\Documents and Settings.

Once you've done that, Registry Editor launches with your own Registry keys marked under _REMOTE. This enables you to perform edits that may help restore your computer to working order again. It is important to make sure that you've taken a drive image before proceeding, just in case your edits only succeed in making things even worse.



Change the access permissions on locked files.



Use Partition Find and Mount as an alternate recovery option.

BROWSE THE WEB

Researching PC problems can help get your machine working again. Happily, Hiren's BootCD comes with a built-in web browser in the form of Opera, which is accessible by double-clicking the Internet shortcut on the desktop. This takes you straight to Google, enabling you to type details about your problem. Knowing what to search for is key, so start by typing in any error messages or symptoms you're facing. If lots of irrelevant results are returned, try narrowing your search by including your version of Windows or extra info about what's causing your problem.

With a bit of luck, you'll find steps you can follow using the tools we've described here. If a solution involves running a third-party program that is not included on your rescue CD, proceed with care: it will need to be a portable tool and may still not run. Additionally, whatever fix that it provides will need to be applied to your actual Windows installation, not to the rescue environment.

BOOT MENU TOOLS

Your Hiren rescue media offers more than the Mini Windows XP environment; there's a list of tools in the main boot menu, too. The most obvious fix flagged on this screen resolves the 'NTLDR is missing' error in Windows XP, but there are other options, too.

If your PC has been randomly crashing or freezing, select either the Windows Memory Diagnostic tool or Memtest86+ to give your memory the

once over. Select DOS programs to choose from a wider selection of recovery, back-up and testing tools – but you must be comfortable with the command line environment if you go down this route. There's even a Linux-based option that takes you into the graphical PartedMagic environment for disk-based troubleshooting and recovery. This also comes with a built-in web browser (Firefox) and networking support. It's worth giving it a go if your network device cannot be detected in Mini Windows XP and you need to get online to try to find a solution.

RESOLVE START-UP ISSUES

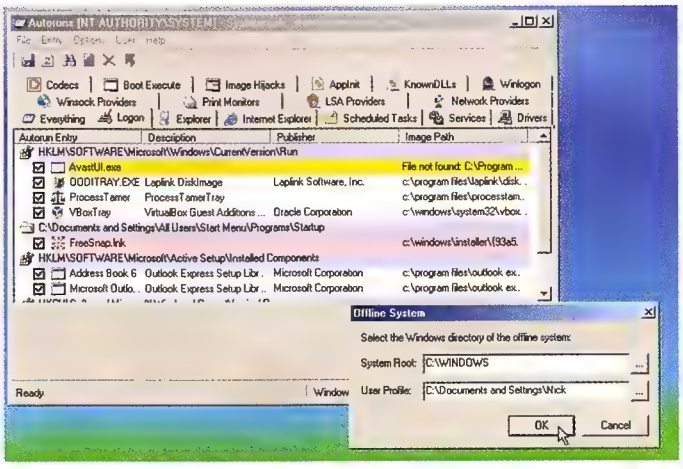
Launch Autoruns from the Startup menu of Program Launcher if you're convinced your problem is due to a third-party program or driver. Select 'File > Analyze Offline System', then click '...' next to System Root to select the C:\Windows folder. Click '...' next to User Profile to select your own user profile folder, then click OK.

Autoruns lets you manage which services and drivers get launched, allowing you to disable them (we don't recommend deleting anything but definite malware, just in case). Autoruns will attempt to provide you with useful information about each program, driver or service to help you identify it, but simply right-click any entry and choose 'Search Online' to find out more about it via Google. Once you've finished tinkering, close the program and reboot to see if Windows behaves itself. If it's still playing up, try booting into Safe mode for a better array of troubleshooting tools.

AND THERE'S MORE...

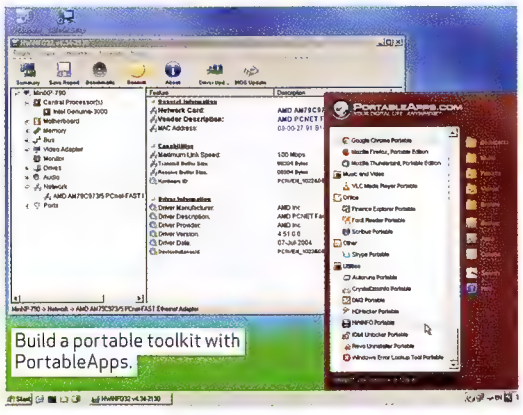
When troubleshooting, you may need to reference documents in text, Word, Excel or PDF formats. Thankfully, all the tools you need for reading these files can be found via the Program Launcher's Editors/Viewers menu. Just download the file, then double-click it to open it in the correct app.

A selection of third-party portable apps will run in the Mini Windows XP environment. You can build your own portable toolkit by downloading and installing the PortableApps Platform from **portableapps.com** – the Support section of the web site can help you set it up. Open the PortableApps launcher and browse your collection to see which work, or select 'Apps > Get More Apps' to download more apps from its directory. Apps worth considering include the Windows Error Lookup Tool for decrypting error codes, and FileZilla for connecting to FTP servers. HWiNFO provides detailed system info, and web browsers Firefox, Thunderbird and Chrome work, too. Portable apps from other sources may also work. NirLauncher (**launcher.nirsoft.net**) is an example of these and includes a collection of over 150 utilities for Windows.

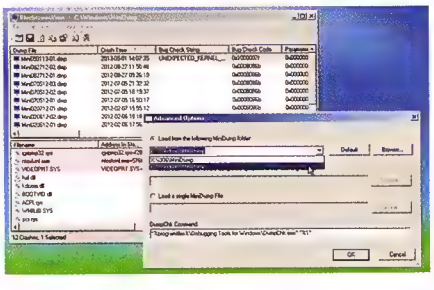


Launch Autorun if you think the problem is related to a third-party program or driver.

Got a problem? Google it.

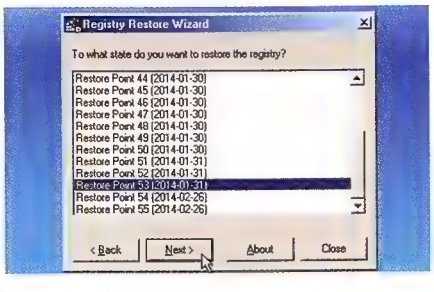


Quick-fire fixes



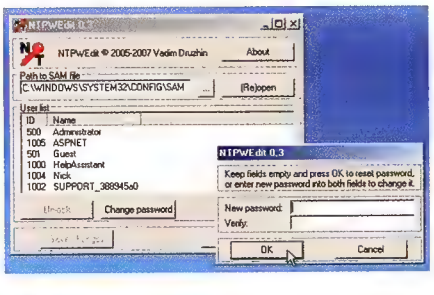
1 TRY TROUBLESHOOTING

If your PC keeps crashing with a blue screen STOP error, launch BlueScreenView from 'Program Launcher > System Information'. Point it towards your C:\Windows\Minidumps folder and it may supply you with handy troubleshooting info.



2 RESTORE THE REGISTRY

If your Registry is corrupted, recover an earlier version from System Restore. Go to 'Program Launcher > Registry > Registry Restore Wizard', select 'C:\WINDOWS', click Next and then recover the first version before your PC crashed.



3 RESET USER PASSWORD

Forgot your user password and can't log on to Windows? Open Program Launcher and click 'Password/Keys > Windows Login > NTPWEdit'. Click '(Re) open', select your username and click 'Change password' to edit or remove it.

how to

» QUICK TIPS

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APC and its readers can be one giant helpdesk. If you have a technical problem, chances are one of us can solve it.

MAC

UPGRADING AN IMAC TO AN SSD

I bought my iMac from Apple in April 2012, and so I consider it to be a late 2011 model. It has an integral 1TB mechanical hard drive installed. I was thinking about replacing the existing hard drive with a 900+GB SSD drive. However, I understand there is an issue with the in-built temperature sensor and the Apple Hardware Test (AHT). Does a new hard drive have to be installed by Apple? Is there a way of having an external SSD drive in a caddy that could be used as the main hard drive (and contains the operating system) that could be connected via Thunderbolt or USB? And would it be faster than the internal drive?
Philip White

From an EMC number you supplied, I can see your iMac is actually the mid-2011 model – there is no late 2011 iMac. But you are right about the temperature sensor problem. All iMacs since 2011 have used hard disks with extra firmware to send temperature readings back to the SMC (system management controller). If you swap in a drive that doesn't supply this info, the SMC runs the fans at maximum speed as a failsafe measure. Various hacks were tried, but the new drives use a non-standard SATA connector with extra wires. No upgrade methods were that satisfactory, but since February, Other World Computing (**eshop.macsales.com**) has offered DIY fitting kits. These include a digital thermal sensor that you attach to your drive and which uses the correct leads to mate with the iMac motherboard. As a home project, I'd put it in the 'advanced' category, but it's possible and it works for an SSD as well. You can still use an external SSD and boot off that however. USB 2.0 isn't quite fast enough to let you take advantage of an SSD though, and your iMac is too old to have USB 3.0, but Thunderbolt is fine. General purpose external caddies that include Thunderbolt adapters are hard to find, so I'd suggest a dedicated external SSD drive.
Luis Villazon

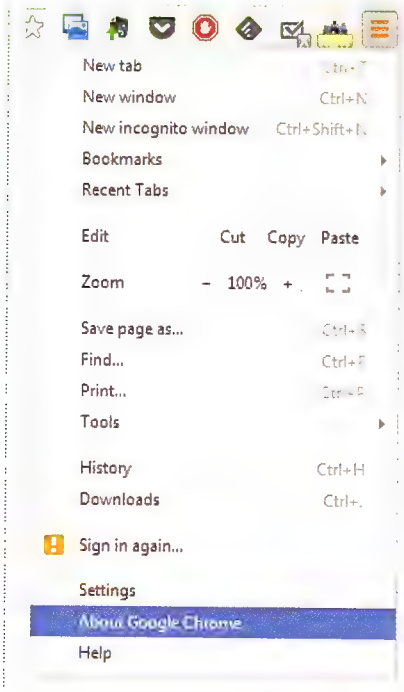
Large SSD drives are expensive but you can boot OS X off a smaller external drive.

INTERNET

FLAKING CHROME

I'm having a problem with Google Chrome. It won't open. I tried reinstalling it, turning off the firewall and switching off my antivirus, but it won't launch. There is no error message or any such activity when I try to launch the browser. My current PC is an HP620 running on Windows 7 and I have 1GB RAM.
Thabani Ndlovu

Have you ever wondered how Chrome installs updates on the fly without you having to shut it down first? Well, I'm going to tell you anyway. Chrome is actually installed twice on your PC. While you use one copy, the auto-updater is silently patching the other. Once an update is installed, a switch is flipped somewhere and Chrome knows to load the other copy the next time you restart. Occasionally though, the update system fails. I've seen it happen on PCs that are left on 24/7 with



You can force Chrome to upgrade by selecting "About Google Chrome" from the main menu.

Chrome open the whole time. Presumably, this causes problems with updates overwriting each other. You can fix the problem by forcing a manual update. Click the spanner icon in the top right and choose 'About Google Chrome'. The About dialog will also do an update check, and if the copy you currently have loaded isn't the latest, you can force a manual update.
Luis Villazon

WINDOWS

SHOULD MY FAMILY BE ADMINS?

I have a Windows 7 PC, with everything working perfectly. But alas, I made my wife and son their own user accounts and every time they log on they are inundated with a number of 'Do you want to allow the following program...' messages on their taskbars. They show "ASUSTeK Computer Inc." as publisher and include the following:
Digi+VRM
NetSvcHelp
TurboVhelp

U3BoostSvr.exe
AISuiteII
Short of making every user an administrator, how can I get rid of these mild irritations and maintain the pretence of me being the true king of my rig?
Chris Barry

Those apps are just motherboard utilities that get loaded into the system tray atstart up. You can temporarily give everyone admin rights, log in to clear the errors and then bust them down to a standard user again.
Luis Villazon

MAC
HOW DO I FORMAT MAC DISKS?

I used to own a Windows PC, but I have just got a Mac. I've not yet seen how to format a Mac. Can you explain it, step by step, for a first-time user?
Fabio Da Costa Jr.

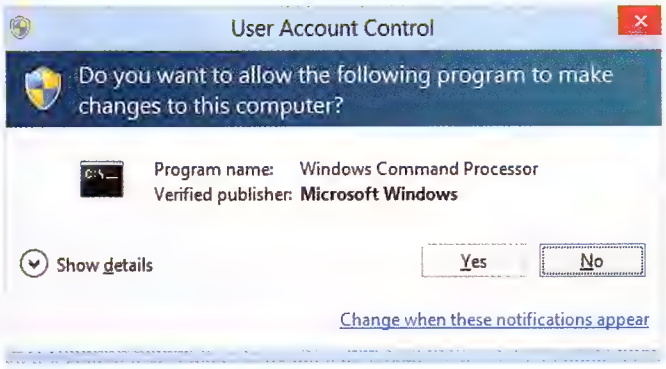
New Macs don't need formatting, they come with OS X preinstalled. However, if you want to reformat and reinstall OS X, restart with Command-R held down and select Disk Utility from the menu. Click Continue, then choose your hard disk from the pane and click Erase. The Format list shows 'Mac OS Extended (Journaled)', which is what you want. Click Erase and when it finishes, click 'Disk Utility > Quit Disk Utility' from the menu. Now click Reinstall OS X and follow the instructions. You need to be connected to the internet for this part because it downloads the OS from the App Store.

If you are formatting an external disk or USB stick, the process is the same except you don't need to restart your Mac in recovery mode. You can use Disk Utility in Applications/Utilities. Drives normally come preformatted with the FAT filing system, which is listed as 'MS-DOS (FAT)' in Disk Utility. You can leave it as this for a USB stick, but for an external drive it's better to change this to 'Mac OS Extended (Journaled)', unless you want it to read on a Windows PC as well.
Luis Villazon

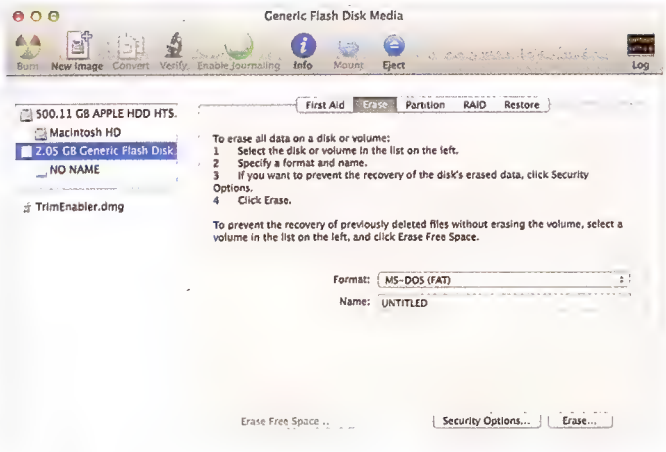
HARDWARE
CORE MELTDOWN IMMINENT!

I'm running an Nvidia GTS 450 ASUS OC 1GB GDDR5 edition. The temperatures I get on my GPU during summer are no less than 60°C. It reaches 70°C when I play DOTA 2 and goes as high as 90°C during a Battlefield 4 match. I'm using MSI Afterburner to monitor my temperatures and I set my GPU fan speed to 100%. How can I reduce my temps?
Zain Daniels

90°C isn't really that big a deal. A Radeon HD 5750 will reach almost that under normal load and the benchmark figures I have seen for the GTS 450 suggest that 73°C under load is acceptable. Admittedly, that temperature is for fans spinning at just 30%, but that just means that your system is noisier than it needs to be. The extra 13°C won't cause hardware failure. It's also not worth jumping to a liquid-cooled setup for the marginal gain you need. If you don't mind the fan noise and you aren't seeing texture or geometry glitches in games to indicate that the card is overheating, you can ignore the temperatures. If you do though, I'd start by making sure you have dusted the heat sink properly and then try placing your PC somewhere with better airflow. If your computer is crouching under a desk with all its cables bunched at the back, it's hard for the hot air to disperse out of the case.


User Account Control
Do you want to allow the following program to make changes to this computer?
Program name: Windows Command Processor
Verified publisher: Microsoft Windows
Show details
Yes
No
Change when these notifications appear

You'll need to enter an administrator password to allow elevated access prompts like this.



Using the FAT file system on small USB drives doesn't affect performance and allows them to be read by both Windows and Mac computers.

High temperatures could be a sign of poor airflow... or the presence of AMD's R9 290X.

HARDWARE
IT STARTS BY ITSELF!

My computer seems to be getting worse. After it shuts down, it no longer starts by pressing the start button. There is power to the motherboard as the LEDs are on and the motherboard buttons are illuminated. Pressing the power button on the motherboard doesn't get my PC started either. I get it powered up by removing the power lead, waiting 10 seconds and plugging the lead back in. The PC then boots straight away without pressing the start button. This has been happening for the last month. Within the last week I have started getting the message 'F1 to enter setup, F2 to load default settings' when my PC starts. The motherboard settings are loaded as standard because I got the message 'Failed to load overclocked settings'. I can no longer overclock the

CPU. So I select F2 and the computer loads as normal.
Damion Mumford

These things are symptoms of corrupted BIOS settings. It's automatically booting when you plug in the power cable, for example, because the 'After power failure' BIOS setting has been flipped to 'Always on'. The front panel start button is ignored because 'Wake system from S5' is set to 'Disable'. (S5 is the sleep state that most of us call 'off' – in other words, when you have shut down from Windows but the PC is still plugged in at the mains.)

The most likely cause of all this is a flat or shorted CMOS battery. They normally last longer than your PC but you may have one that has sat on the warehouse shelf for a few years. Have a look on the motherboard for the coin-sized lithium cell and replace it with a new one of the same type. I'm 90% sure that will do it, but if it doesn't, try jumping the BIOS to restore the factory settings.
Luis Villazon

The BIOS is your friend. Get to know it. Buy it flowers. Or a beer.

If there's some problem in your PSU the best bet is to replace rather than attempt a repair yourself.

HARDWARE
SYMPHONY SHUTDOWN

My PC has begun to switch off at random. I cannot imagine what is provoking it, but I have tried re-seating the memory and my graphics card. No joy — in fact, after that, it would switch off within seconds of my switching it on. Next, I tried removing the memory altogether. Lots of beeps from the machine. Then I put each memory module back, one by one, into each of the slots. Everything seemed to work OK and I put both memory chips back in. Now it switches off when playing back dense, multiple high-res samples in Cubase 6. As I only have 4GB of RAM, Cubase has always struggled a little when I have made too many demands (like using the 24-bit samples in Halion Symphonic Orchestra). Am I right to suspect that some piece of hardware has gone for a ball of chalk, and if so, which one?
Simon Cushman

It could be overheating, but that's not consistent with the way the problem got worse after you reseated the RAM and graphics cards. Normally, when people take the case off and have a poke around, they blow away any thick buildup of dust and overheating issues improve somewhat. This seems more like a dry solder joint to me, and the most likely locations are on the motherboard or the PSU. Since you won't be able to find the microscopic hairline crack in the solder, and won't be able to repair it if you do, you will probably need to replace either the motherboard or the PSU. The PSU is the cheaper and easier option, so start there first.
Luis Villazon

LINUX
REPEATED BACKUPS

I use Rsync to backup my server to both local USB and networked drives. All works fine with all files except those with a .wtv suffix that have been recorded from my lounge room media centre and these always get recopied every time I do a backup. This takes a huge amount of time. A line from my backup program is:

rsync -vare ssh --progress --omit-dir-times --delete --exclude .Trash --exclude lost+found* / media/Drive-F1/ /media/Drive-N/*
Reg Cowell

There's nothing in your Rsync options that would cause these files to be treated any differently, so the obvious conclusion is that they are changing. As they are in use by your media centre, it's possible the software is modifying the files in some way as part of its operation. This may be changing the content or only be updating the timestamp of the files as it touches them, during some of its internal operations, such as indexing.

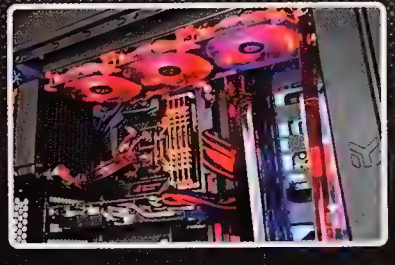
The first step is to determine how the files are changed. Look at the original and backup files before your backup run to see whether the file date or size has changed. If the size is unchanged, use a checksum program like md5sum to see whether the contents have changed. If this is only a change of timestamp and the file size is unchanged, you can use the `--size-`

CORE V71

not just a pretty case...

...it has the features to back it up too

Water Cooling Capability



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`only` option to Rsync to skip these files. This may be risky on other files, the safest approach would be to run Rsync twice, the first time with `--exclude *.wtv` and again with `--size-only` and `--include *.wtv`. Something like

```
rsync -av --exclude .Trash*
--exclude lost+found*
--exclude *.wtv SRC DEST
rsync -av --size-only
--include *.wtv SRC DEST
```

If the file contents are slightly modified too, as evidenced by a change of size or checksum, you can use the `--ignore-existing` option instead of `--size-only`, but this should definitely be reserved for a separate run just for the WTV files. Incidentally, a couple of your Rsync options are unnecessary. For local transfers, as in your example, `-e ssh` is ignored, and for remote transfers it's the default anyway. Also, `-r` is set by `-a`, there is no need for you to specify it separately.

There's another option available to you that's a little more work but worth it for a good backup system solution. If you run the Rsync daemon on the destination machine, it will compute differences between versions of the same file and only transfer the altered blocks instead of the whole thing.

We use this when uploading ISO images for the *APC* cover discs. It means an altered image can be uploaded in minutes instead of the usual couple of hours. You need to configure a destination in /etc/rsyncd.conf on the target system:

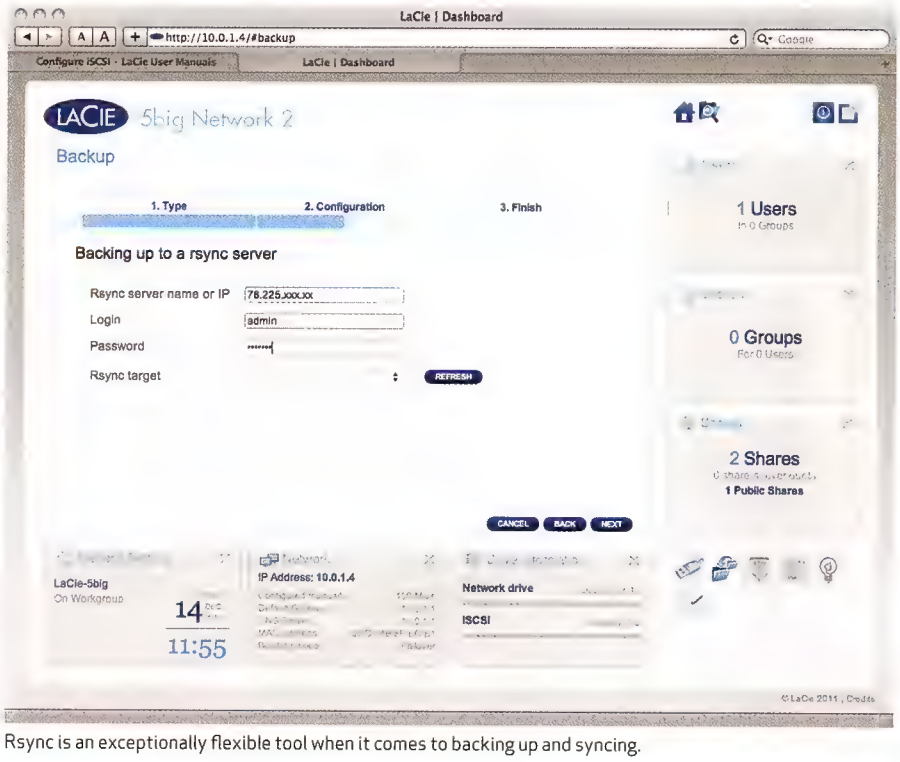
```
path = /media/Drive-N
comment = Backup directory
```

Then run your backup like this, using the hostname of the target system (or localhost for the USB) and the name of the Rsync destination you set up in rsyncd.conf:

```
rsync -va --progress --omit-
dir-times --delete --exclude
.Trash* --exclude lost+found*
/media/Drive-F1/ rsync://
hostname/backup/
```

This will help you in keeping all the backups of those large files up to date while saving on the large transfers.

APC staff



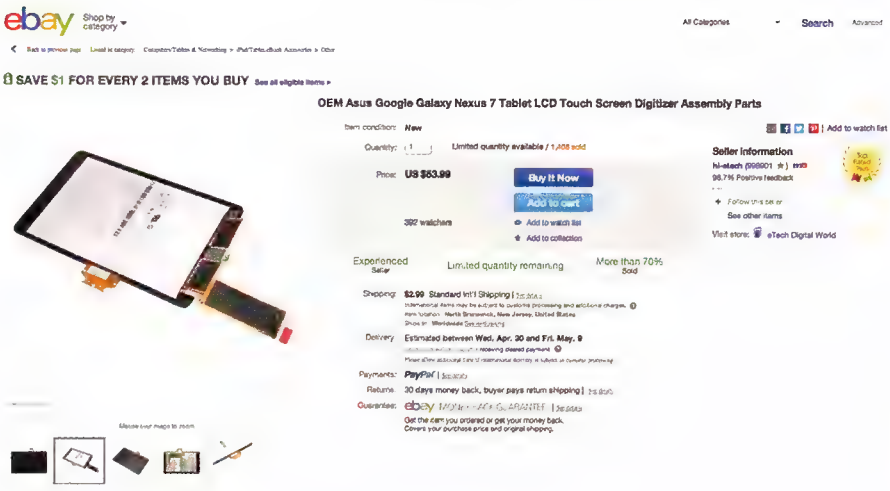
Rsync is an exceptionally flexible tool when it comes to backing up and syncing.

HARDWARE

RADIATION HAZARD?

Recently, my son dropped his Nexus 7 tablet and the screen broke. He needs the tablet for school and says it is still functional with a wireless keyboard paired and a mouse plugged in. My immediate concern is to whether he is being exposed to any health hazard from looking at and working with a tablet that has no screen any more.

Alois Ruider


SAVE $1 FOR EVERY 2 ITEMS YOU BUY
OEM Asus Google Galaxy Nexus 7 Tablet LCD Touch Screen Digitizer Assembly Parts
Buy It Now
Add to cart
Seller information

If you're scared of exposure to a busted screen, you may not want to tackle the job of replacing it, but the option's there...

Nope. Completely fine. Tablet computers are not filled with plutonium, cyanide gas, anthrax spores, Haitian voodoo curses or anything else that can leak out and kill you if the screen is cracked. Certainly they emit electromagnetic radiation of various wavelengths, but this is perfectly safe. Electromagnetic radiation ranges from very long wavelengths like radio waves, through visible light, all the way to x-rays and gamma rays at the shortest wavelengths. The shorter the wavelength, the more energy is carried by each photon and so the more potential they have to be harmful, but it's all a question of the intensity of the radiation. Visible light will kill you if someone focuses a terawatt laser beam at your head, but you don't worry about the light that shines from your monitor screen. Likewise, the 60mm wavelength used by Wi-Fi networks lies within the microwave range, but it's much too faint to cook your insides.

In any case, even if you were ignorant enough to believe that tablets emitted dangerous radiation, there is nothing about the glass screen that would keep it in. The point of those signals is to travel to other computers, so it would be pointless to build the case from materials that block them. If you are happy to use a tablet with an intact screen, you should be just as happy to use one with a cracked screen.

What you do risk, however, is the health of the tablet itself, so it's a good idea to get the screen fixed as soon as possible. You can find replacement screens for most tablets on eBay.

Luis Villazon

disc contents

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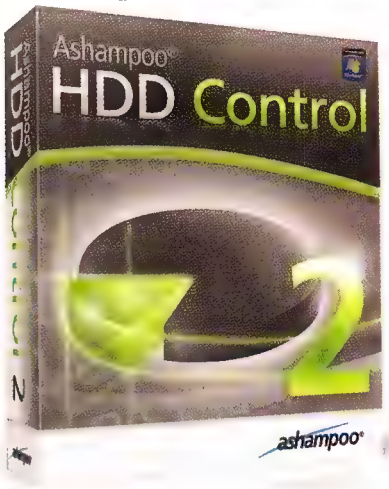
ISSUE 404 JULY 2014

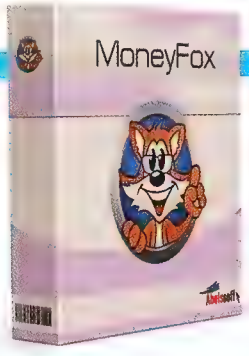
Health check for your hard drive

Monitor and maintain your hard drive easily with Ashampoo HDD Control 2.



FULL VERSION WORTH $26

The hard drive is one of the most important components of your computer. Even if a hard drive works flawlessly, it should still be regularly checked and maintained. This way an imminent hard drive failure can be detected early and might be prevented. If suddenly major problems occur or if your hard drive even completely fails, data loss might be the result. Make sure you are prepared for such a situation. Ashampoo HDD Control 2 can notify you early so that your valuable data won't become the victim of a hardware crash.



MANAGE YOUR FINANCES EASILY

Keep a handle on your money matters with Abelssoft MoneyFox 2014

FULL VERSION WORTH $29

MoneyFox makes smart financial management easy. With the summary view and the transaction list, you can keep track of your finances quickly and efficiently and see immediately where your money goes. The statistics page provides you with configurable statistics, where it is possible to evaluate your financial situation over a long time period. The creation of self-defined templates and regular bookings simplifies data entry. Set up a regular and recurring entry, get a reminder upon maturity and book it with only one click. Synchronise your data on multiple computers via Dropbox, Skydrive or another cloud provider, and lots more!

NEVER FORGET YOUR PASSWORDS AGAIN

Take control of your password security with 1-abc.net Password Organizer

FULL VERSION WORTH $21

These days, everyone has so many different passwords that it can be a real problem trying to remember them without writing them down. But if you write them down, they're not secure! Think about it: logins for messenger clients, email accounts, work and home PCs, security codes for online banking and more. 1-abc.net Password Organizer uses proprietary encryption and allows you to organise all your passwords and login data so that you only have to remember your one master password. Additionally, it offers many useful functions to do with secure password management.

PLUS! LEGIONWOOD: TALE OF THE TWO SWORDS — FULL GAME & PHOTOGRAPHY ESSENTIALS TOOLKIT

SYSTEM REQUIREMENTS

- A DVD-ROM reader or burner.
- The *APC* disc is designed for use with up-to-date browsers (for example, Internet Explorer, Chrome, Firefox).
- The interface included on the *APC* disc requires a JavaScript-enabled browser.
- An internet connection may be required for online registration of software before use.
- The software packages on the *APC* disc have different system requirements. Software is included on the disc for Windows XP, Vista, 7 and 8.

BEFORE INSTALLING

- Check the disc using a virus scanner complete with the latest antivirus data updates. The disc was checked before burning, but new viruses are being discovered all the time.
- Back up any important system and data files. It is not recommended that the software contained on these discs be installed on production machines.
- If you have any questions regarding the use of the *APC* disc, click the 'Help' button at the top of the screen.

USING THE DISC

- Insert the disc into a CD/DVD-ROM reader or burner and your web browser should automatically load the interface. If not, launch your web browser and load the default.html file from the root directory of the disc.

HELP

- If you have any problems with the *APC* disc, please visit **www.apcmag.com/disc.htm**.
- *APC* provides no technical support for this disc or any software provided on it.

NO DISC?

Please note that the free cover disc is not included with special promotional copies of *APC*.

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Automator at your service

In the second instalment of a series on OS X's oft-overlooked Automator tool, Matthew JC. Powell uses it to enhance another powerful feature you might have missed: Services.

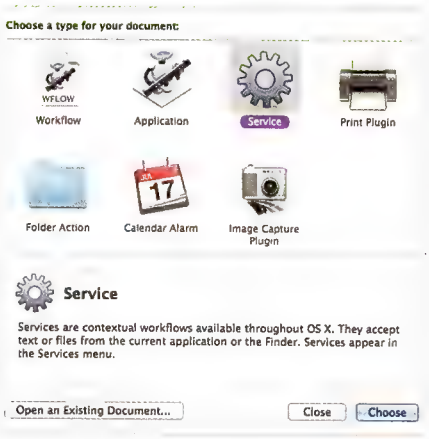
Last issue we took a first look at the basics of Automator and then built a sample Workflow that could also be saved as a stand-alone Application. Pretty cool stuff. The problem with either Workflows or Applications, though, is that you have to leave the application you're working in to use them.

That's OK when you're automating Finder actions like renaming batches of files and the like, but it's annoying if you want to take input – such as text or graphics – from the application you're using and do something with it. That's where Services come in handy.

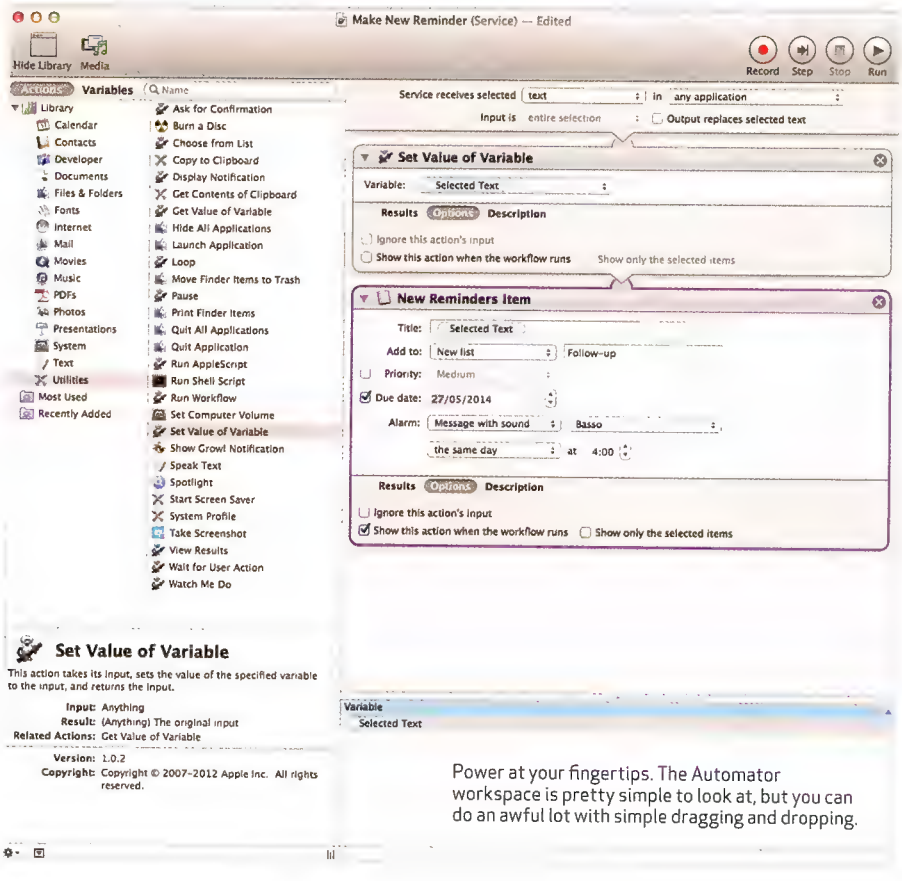
Services operate throughout the system, in any application (including the Finder) that supports them. They are, in essence, automation scripts that have been built by Apple and third-party developers in order to make everything work together smoothly. They've been in OS X since its earliest days, but have waxed and waned in importance as Apple experimented with other methods of doing similar things – such as Dashboard widgets.

In Mavericks, you'll find the Services available to you in any given application under the Application menu – that is, the menu that shows the name of the application you're using. In Safari, for instance, click on the word Safari in the menu bar and scroll down to Services to see a menu of added functionality that's available to you. You can also access Services from a contextual menu by right-clicking in an application – the Services are listed at the bottom.

Note that what Services are available vary depending on what other applications you have installed, and what sort of content you might have selected. Select some text, for instance, and Services including "Tweet" or "Look Up In Dictionary" become available. Select an image, and you might get "Open In Pixelmator" – but only if you have Pixelmator, of course.



Pick a flow, any flow. You can use Automator to make a number of different types of Workflow, and it's a good idea to choose at the start — it can be tricky to change your mind later on.



Power at your fingertips. The Automator workspace is pretty simple to look at, but you can do an awful lot with simple dragging and dropping.

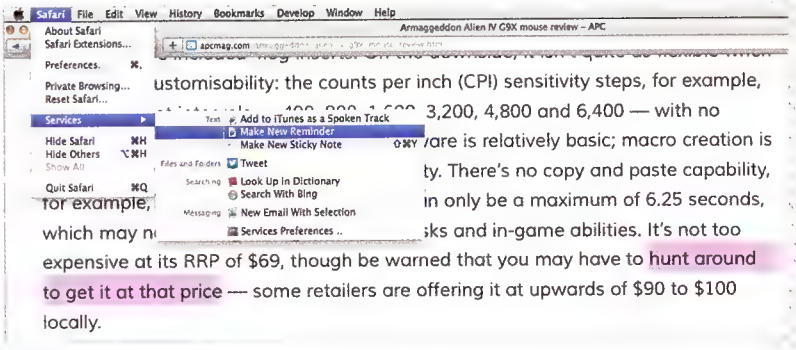
To see the gamut of Services available to your system, open up System Preferences and select the Keyboard pane. Then click on the Shortcuts tab and, in the list on the left, click on Services. Most of them don't have keyboard shortcuts attached, and a lot will not be selected – Apple doesn't want to over-crowd your Services menu. If you like, select a few extra Services and see what they can do for you. There's no harm in exploring.

Even with all of the many Services provided for you, you may find that your Mac still lacks a little bit of functionality that you might find useful. For example, it's easy to set yourself a Reminder based on text you receive in an email, because Mail (and most Mac email programs) supports Data Detectors and can recognise text that looks like it might be something you want to be reminded of. But what about Safari, or Pages? What if you're reading a PowerPoint document and you see something that you want to flag, to remind yourself to do further research? There's no straightforward way to turn arbitrary text into a useful Reminder.

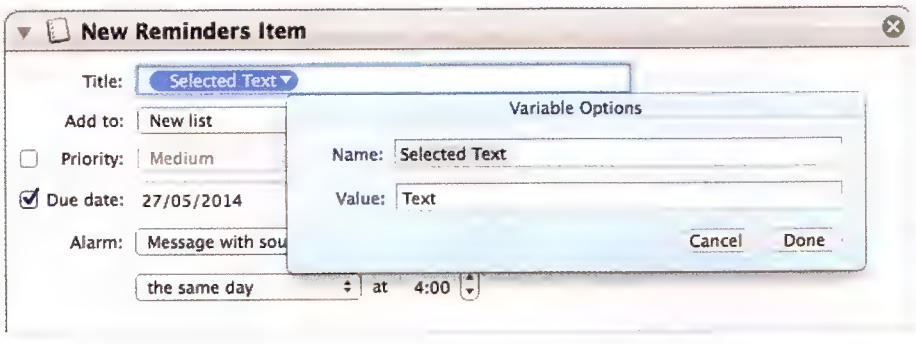
That's where Automator comes in.

When you start a new workflow in Automator, you're invited to choose from a number of types of projects.

A matter of Preference. You'll find a list of available Services hidden in the Keyboard pane of System Preferences. This is because you can, should you so choose, assign keyboard shortcuts to them.


Safari File Edit View History Bookmarks Develop Window Help
About Safari
Safari Extensions...
Preferences...
Private Browsing...
Reset Safari...
Services
Hide Safari
Hide Others
Quit Safari
Add to iTunes as a Spoken Track
Make New Reminder
Make New Sticky Note
Tweet
Look Up in Dictionary
Search With Bing
New Email With Selection
Services Preferences ..
ustomisability: the counts per inch (CPI) sensitivity steps, for example,
3,200, 4,800 and 6,400 — with no
/are is relatively basic; macro creation is
ty. There's no copy and paste capability,
in only be a maximum of 6.25 seconds,
for example,
which may n
sks and in-game abilities. It's not too
expensive at its RRP of $69, though be warned that you may have to hunt around
to get it at that price — some retailers are offering it at upwards of $90 to $100
locally.

Remind me. Once your Service is saved, you can select text in any application (such as this mouse review in Safari) and use the Service to create a Reminder from it. Note that the Application menu is only one of several ways to get at your Service.



Spelling counts. You can give variables any name you want, but make sure that you give the variable exactly the same name every time it's referred to in your Workflow. This is especially important in workflows with multiple similar variables.

For this tutorial, select Service.

First, click on Actions and, if necessary, click on the disclosure triangle next to Library to see the various scriptable applications available to you. Even though we're creating a reminder (which you might think would involve the Reminders application, choose Calendar. Then, from the next column, choose 'New Reminders Item' and drag it into the workflow window. Click on Options and tick 'Show this action when the workflow runs' – that will allow you to set some parameters for your Reminder such as a due date.

If you wanted to, you could save that Service as it is right now, and from whatever application you're in you would have the option to create a new Reminder. But we're going to be cleverer than that.

Go back to the Library and click on Utilities. Then, in the next column you'll find an Action called 'Set Value of Variable'. Drag that over to your workflow and drop it above 'New Reminders Item'. You'll be asked to identify a variable – SelectedText is as good a name as any. Make sure that the drop-down menu at the top of your workflow says that this workflow accepts selected text in any application.

Next, in the New Reminders Item action, right-click in the box next to Title and select 'New Variable'.

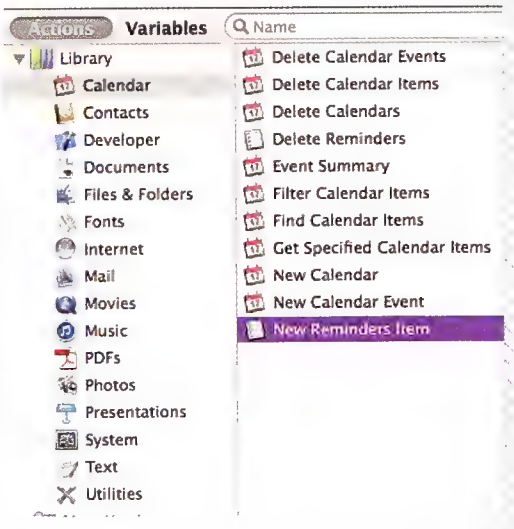
Call your new variable 'SelectedText' (it's very important that it exactly matches the name of the variable you created earlier).

What you've done is told Automator to take any text that you've selected in any application and assigned it to the variable SelectedText, then create a Reminder with that text as its title. Pretty nifty, huh?

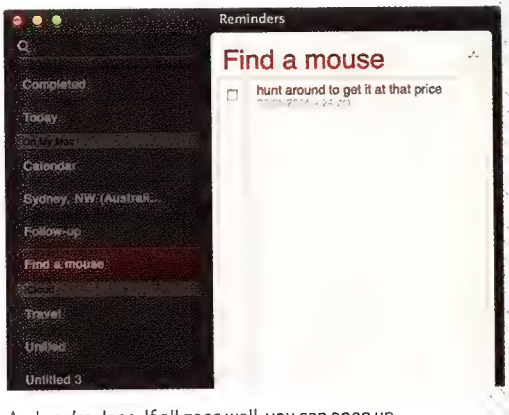
Save your Service, and give it a memorable name like 'Create New Reminder'. To be on the safe side, head over to 'System Preferences > Keyboard > Shortcuts' and make sure it's ticked so that it will appear in the Services menu (by default new Services you create are ticked, but it never hurts to check).

Now test it out. Open up a web page or a word processing document – or anything, really – and highlight some text. Go to the Services menu (either under the Application menu or in a contextual menu) and select your new Service. Add a due date and any other information you might want to customise, and click Continue.

And you're done. If you look in your Reminders app, you'll find your newly-created Reminder, with the text you selected as its name. If you're an iOS user, you'll also find it on your iPhone or iPad, and you'll get alerts when it's due.



Once were calendars. Recent versions of OS X have pulled the To Do functionality out of the Calendar application (which used to be called iCal) and made it a separate application called Reminders. This brings it more into line with iOS, but there are still some odd artefacts, like finding Reminders Actions under Calendar in Automator.



And you're done. If all goes well, you can open up the Reminders app on your Mac or iOS device and you'll see the Reminder you just created.

Getting help in Linux

Neil Bothwick browses the ultimate collection of useful self-help books that reside inside the Linux operating system.

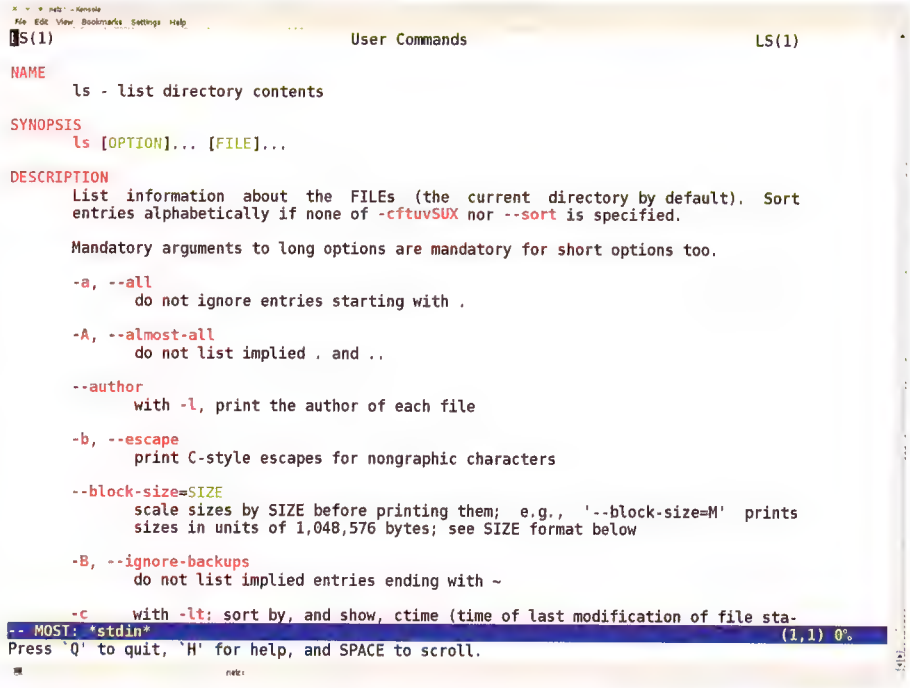
RTFM has long been considered the battle cry of the supposed Linux experts, and is claimed to scare new users away. If you haven't come across the term before, it stands for something like 'Read The Fine Manual'. It is perhaps easy to appreciate the frustration some individuals feel when asked a question for the umpteenth time when the information is clearly covered in the manual. However, it's only possible for a user to read a program's documentation if they know where to find it. Happily, there are some sources of help within Linux, so let's look at each of them.

Before you even look for the manual, remember that many programs have built-in help. Run the command from a terminal with the `--help` option to see a synopsis of its options. This applies to GUI programs, as well as shell commands. For example: `firefox -help`

If you need more detail, then it may be time to RTFM, which on Linux systems usually means the man page. Man pages document just about everything on your system and are viewed by keying in the man command. If you want to know how man itself works, the classic recursive example is to open a terminal and run: `man man`

A man page is a single page containing the reference documentation for its topic. The man command renders this document as readable text and displays it in your default pager, usually less. This means you use the same keyboard controls as less for navigating the page: Cursor Keys to scroll up and down, the Space Bar to page down and so on. Some man pages can be very long, so try `man bash` to enable you to search. In less, press `/` to start searching (or `?` if you want to search backwards) followed by your search term. Then use `n` to jump to the next match or `N` for the previous one. The man pages are divided into sections:

1. User commands
2. System calls
3. C library functions
4. Devices and special files
5. File formats and conventions
6. Games et al
7. Miscellany
8. System administration tools and daemons


LS(1) User Commands LS(1)
NAME
ls - list directory contents
SYNOPSIS
ls [OPTION]... [FILE]...
DESCRIPTION
List information about the FILEs (the current directory by default). Sort entries alphabetically if none of -cftuvSUX nor --sort is specified.
Mandatory arguments to long options are mandatory for short options too.
-a, --all
do not ignore entries starting with .
-A, --almost-all
do not list implied . and ..
--author
with -l, print the author of each file
-b, --escape
print C-style escapes for nongraphic characters
--block-size=SIZE
scale sizes by SIZE before printing them; e.g., '--block-size=M' prints sizes in units of 1,048,576 bytes; see SIZE format below
-B, --ignore-backups
do not list implied entries ending with ~
-c with -lt: sort by, and show, ctime (time of last modification of file sta-
-- MOST: *stdin* (1,1) 0%
Press `Q' to quit, `H' for help, and SPACE to scroll.

This is the man page for ls, and it helpfully lists the various options that you can use in alphabetical order.

> "If you haven't come across the term before, it stands for something like: Read The Fine Manual."

As a normal user, you would normally only use sections 1, 5 and 8 (and possibly 6). If you use the section number with the man command, it will only look in that section, otherwise it will show the first match it finds. This is necessary because you can have more than one page with the same name. The `passwd` command is used to set user passwords, which are stored in the file /etc/passwd. Try:

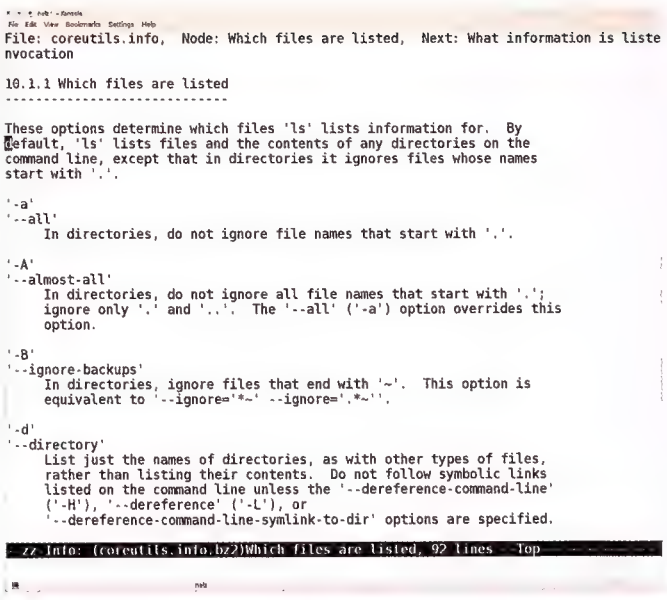
```
man passwd
man 1 passwd
man 5 passwd
```

The first two document the passwd command from section 1, while the third shows the man page for the passwd file. This is one of the strengths of the man page system – it documents everything: commands, configuration files, library functions and more. It's not limited to specific commands or files, and section 7 contains man pages for all sorts of things. Ever wondered how symbolic links work, or what happens when you turn on your computer? Try:

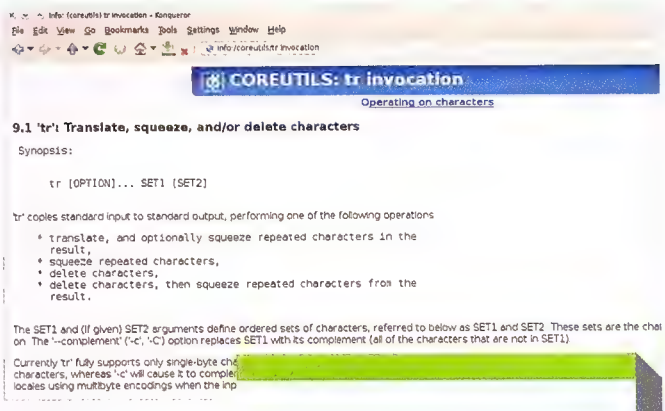
```
man 7 symlink
man 7 boot
```

QUICK HELP

There is more to man than a bunch of formatted text pages and a program to display them in a pager. Man maintains a searchable database of pages, which is updated automatically by Cron, and has some other programs for working with it. Each man page has a NAME section, which includes a short description of the page's topic. The whatis command gives the description – it tells you what the program (or file) is, without going into details of options. Here is the classic geeky, recursive example:


File: coreutils.info, Node: Which files are listed, Next: What information is liste
nvocation
10.1.1 Which files are listed
These options determine which files 'ls' lists information for. By
default, 'ls' lists files and the contents of any directories on the
command line, except that in directories it ignores files whose names
start with '.'.
'-a'
'--all'
In directories, do not ignore file names that start with '.'.
'-A'
'--almost-all'
In directories, do not ignore all file names that start with '.';
ignore only '.' and '..'. The '--all' ('-a') option overrides this
option.
'-B'
'--ignore-backups'
In directories, ignore files that end with '~'. This option is
equivalent to '--ignore='*~' --ignore='.*~''.
'-d'
'--directory'
List just the names of directories, as with other types of files,
rather than listing their contents. Do not follow symbolic links
listed on the command line unless the '--dereference-command-line'
('-H'), '--dereference' ('-L'), or
'--dereference-command-line-symlink-to-dir' options are specified.
zz-Info: (coreutils.info.bz2)Which files are listed, 92 lines --Top

The ls info page goes into more detail and groups options according to their function. Info pages generally provide more detail than man pages.


COREUTILS: tr invocation
Operating on characters
9.1 'tr': Translate, squeeze, and/or delete characters
Synopsis:
tr [OPTION]... SET1 [SET2]
tr' copies standard input to standard output, performing one of the following operations
translate, and optionally squeeze repeated characters in the result,
squeeze repeated characters,
delete characters,
delete characters, then squeeze repeated characters from the result.
The SET1 and (if given) SET2 arguments define ordered sets of characters, referred to below as SET1 and SET2. These sets are the cha
on. The '--complement' ('-c', '-C') option replaces SET1 with its complement (all of the characters that are not in SET1).

KDE users can read info and man pages in a browser, with clickable links, thanks to KDE's KIO slaves.

```
whatis whatis
whatis                  (1)
- search the whatis database
for complete words
```

This is a faster way to see what commands do, especially if you want to check more than one: `whatis grep sed symlink`.

The whatis command searches only the name, and only matches on whole words, so it assumes you know the name of the command and just want to know what it does. For a more wide-ranging search, use `apropos`, which does a similar job but searches the descriptions as well and returns all matches – compare these two commands:

```
whatis png
apropos png
```

There is another form of documentation that's favoured by the GNU project: info pages. While a man page is basically one very long text file with a bit of formatting markup, an info document contains a tree of linked pages in a single file. It's more like HTML than plain text, but is designed for reading in a text console and all the 'pages' are contained in a single file. Unsurprisingly, the command to read info pages is this: `info info`.

This time, the self-referencing is not gratuitous. Man pages are intuitive to navigate – it's just like reading any other text in a pager. Info uses a different set of key commands, so reading its own info page is a good place to start. You move around individual pages as you would normally, but if you press Enter when the cursor is on a link (noted by an asterisk), you descend into that node.

To go back up to the parent node, press `u`. You can also navigate within a level of the documentation tree with `n` and `p`, which take you to the next and previous nodes.

If you have ever looked at any GNU documentation online (**tinyurl.com/yfub56**) you will recognise this layout. It's simpler than HTML, with the navigation commands generally moving around the same level of the tree or up and down one level.

You may be asking yourself what the point of this structure is. Well, if you've ever tried to find information in a long man page, like `man bash` or `man mplayer`, you'll know how frustrating and time-consuming the 'everything on one page' approach can be. Info documents are divided into sections and chapters, enabling clearer and more succinct presentation. The majority of GNU programs have fairly brief man pages, but have more detail in their info pages. Splitting the document up into pages alters the way that searching is carried out. Press `s` followed by a search string and then Enter. Info will jump to the next occurrence of the string, even if it's in a different node. Continue to press `s` then Enter, with no search string, to jump to subsequent occurrences of the same string. Those keys, plus `q` to quit, should enable you to navigate info pages with ease.

You might be wondering why we're not using HTML. The main reasons are that info pre-dates HTML, and that info documents are contained within a single file. Conceptually, they are similar – so much so that info2html (**info2html.sourceforge.net**) can be used to convert an info document to a series of HTML pages.

Desktop viewing

Man and info are intended to be readable in a terminal, since you may need to use them on a system without a desktop. There are GUI viewers for them, the most convenient being in KDE where you can press Alt-F2 and type `man:/command` or `info:/command` and get an HTML formatted version of the document displayed in Konqueror. There are also the tkInfo and tkMan programs to display the respective formats in a GUI window.

There are several web sites containing comprehensive man page collections: such as **linux.die.net**, **www.linuxmanpages.com** and **manpages.ubuntu.com**. These are particularly useful if you want to read about something you do not have installed locally.

Printing manuals

There may be times you want hard copy. As man pages are stored in a markup format and converted for display by the man program, you can use the `-t` option to convert them to a printable format, Postscript by default, like this:

```
man -t somecommand | lpr
```

The Postscript is output to stdout, piping it to lpr like this sends it straight to the printer. You could also convert the Postscript to PDF, and therefore create versions of your man pages suitable for carrying around on a tablet or e-reader:

```
man -t somecommand |
ps2pdf -  somecommand.pdf
```

Print info documents by passing them through the `col` command:

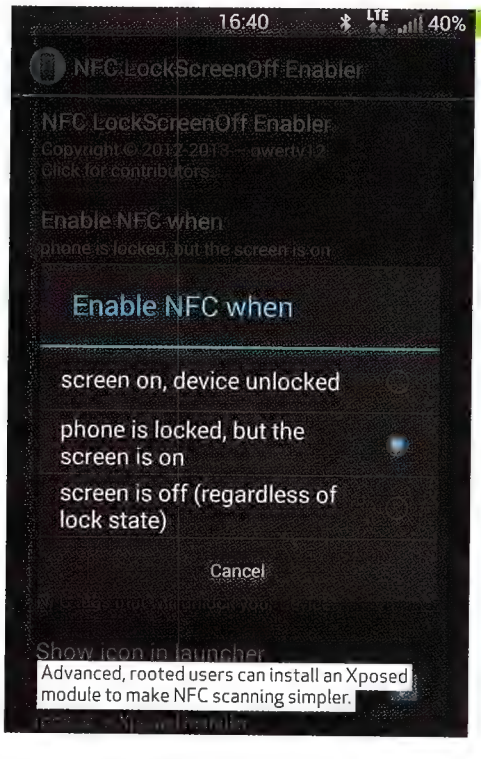
```
info somecommand | col
-b | lpr
```

You can buy NFC stickers for less than $1 each.

Automate Android using NFC

Simon Chester gives your phone hyper-local contexts with NFC.

Automating settings – such as ringtone volume – based on your current situation is a well-established past time for Android geeks, thanks to apps like Tasker. However, while these apps work really well for you being 'at home' or 'at work', they can't really know when you're 'at your desk' or 'in the car' – even though your phone will have different requirements during these situations.



Advanced, rooted users can install an Xposed module to make NFC scanning simpler.

Limitations of NFC

Note that, in order to preserve battery and improve security, your device needs to be unlocked and with the screen turned on when you want to scan an NFC tag. This can be circumvented on rooted devices by installing Xposed and the NFC LockScreenOff Enabler module, which will give you the option to read tags while the screen is off, or while the screen is on but the phone is still locked, and also give the phone the ability to monitor when the phone has been removed off of an NFC tag (handy for putting a sticker in a dock, or on your nightstand). Rooting your handset is not for the light-hearted, but you can find out more at your device's specific sub-forum at **forum.xda-developers.com**, and more on Xposed at **repo.xposed.info**.

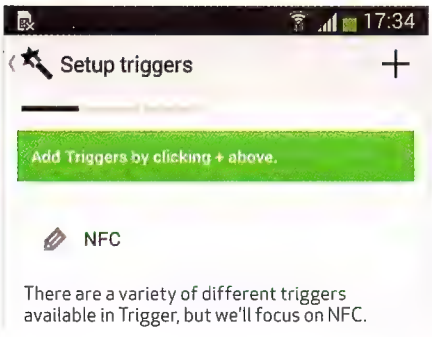
Thankfully, there is an easy, cheap way to achieve this hyper-localisation of your device – and it even integrates with Tasker if you already use that. All you need is some well-placed NFC stickers/tags, and an app called Trigger.

NFC, or Near Field Communication, is a method to transfer small amounts of data by touching your phone (or other NFC device) against a specific surface. You're probably familiar with it already, as the touch-to-pay PayPass/PayWave feature of your credit card uses this technology.

With the right app, however, you can use an NFC tag to trigger any action on your phone. So, placing NFC tags around your house – near your TV, on your desk etc. – or in your car, allows you to set your phone to best match your current needs.

You can purchase compatible NFC stickers for less than $1 each on eBay (at the time of writing, you could get a ten pack for $7.50). It's worth noting that, if you were hoping to stick the NFC tag to a metal surface (such as the aluminium chassis of your ultrabook – which is a great way to quickly enable your WiFi hotspot), then you'll need a special sticker designed for use on metal, which cost a little more.

To get started with automating your life, the first thing you'll need to do is



There are a variety of different triggers available in Trigger, but we'll focus on NFC.

install Trigger. There is a $3.10 in-app Pro upgrade that will allow you to trigger tasks based on time of day, battery level, charging status, headset un/plug, calendar entries, and location – rather than just the included Bluetooth, Wi-Fi, or NFC triggers – which can be very handy. However, if you already use Tasker, these features are moot and you can just use the free version of Trigger to pass on NFC events to Tasker.

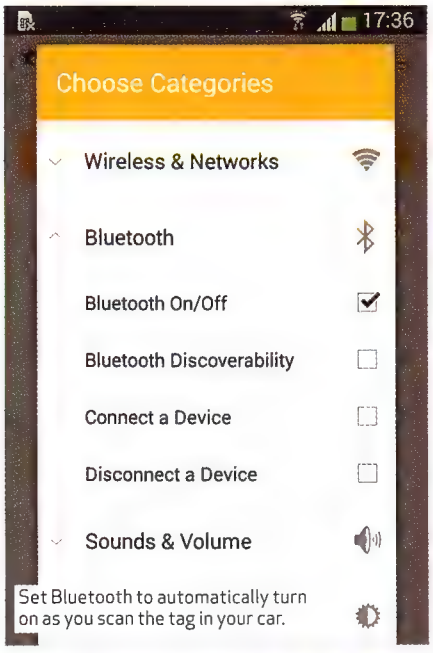
So, the first thing to do is think of what you want to trigger via an NFC scan. To give you an idea of what's possible: you can embed your Wi-Fi password in an NFC tag, making it simple to share with friends; you can set a timer on your phone, so that your tea never ends up tasting bitter; you can wake your home theatre PC, open the remote control app on your handset (or smart watch), and even turn on the TV and Hi-Fi, too.

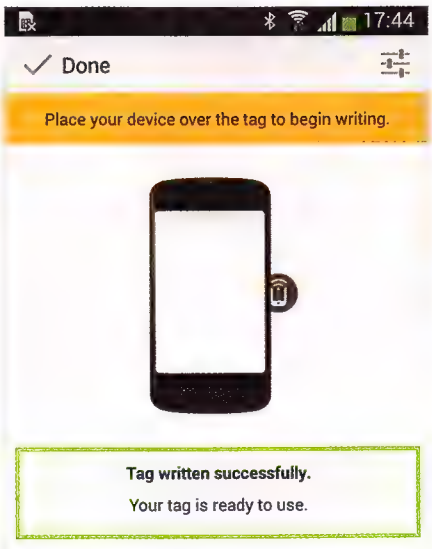
For this guide, however, I'll focus on something simpler – moving your device into a 'car mode'.

Before placing your sticker on your car dashboard, you should first set it all up, so open up Trigger, and add a new task by pressing the '+' symbol in the top right of the screen.

You first need to choose a trigger: Wi-Fi, Bluetooth, or NFC. If your car has Bluetooth, and you always have Bluetooth enabled on your phone, then this can be a seamless way to activate car mode. However, there are battery (and security) benefits to only turning Bluetooth on when it's needed, so I prefer NFC. Choose NFC, and then press Next.

On the following screen, you choose the actions to occur after you scan the NFC tag. If you're using Tasker, you simply choose 'Tasker Task' from the Tasker sub-category (you'll choose which Task on the following screen). If you're not using Tasker, then you'll want to choose, say, 'Bluetooth > Bluetooth On/Off' (or 'Connect a Device') and 'Applications & Shortcuts > Open Application'. Press Next to configure those selected actions, choosing to turn Bluetooth on, and then load your application of choice (say, Google Maps, or – in my case – Google Play Music).





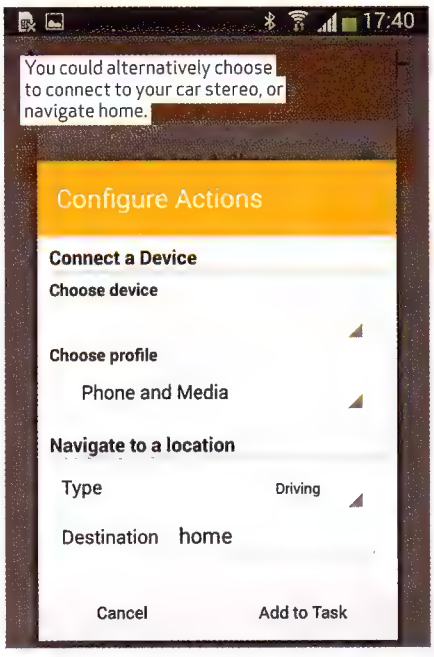
The final step is to write the commands to your NFC tag.

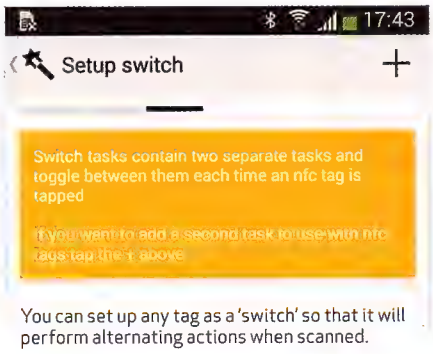
On the following screen, you can set up the tag as a switch – meaning that you scan it once to activate, and again to deactivate. If you want to do this, simply add in tasks that undo those activities you just performed – in this case, turning off Bluetooth (there's no need – nor way – to close an app).

The final screen is where you write these instructions to your tag – which allows other phones to perform the same actions when the tag is scanned (after they've been prompted to install Trigger, of course).

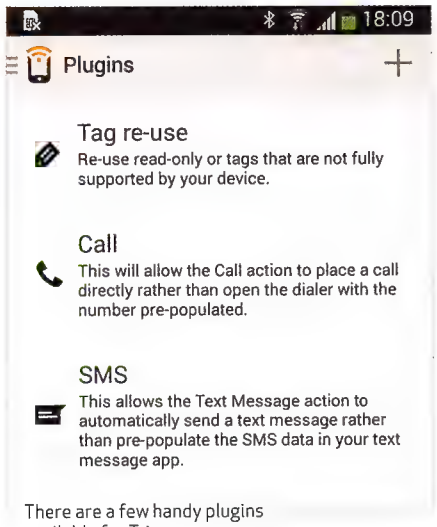
This is as simple as tapping your new NFC sticker to the back of your phone. You should now test to see that the tag works the way that you expect it to (i.e. turning on Bluetooth and opening your music app) before sticking it to your dashboard.

Notably, you can reuse any 'read-only' NFC tags that you may have lying




17:43
Setup switch
Switch tasks contain two separate tasks and toggle between them each time an nfc tag is tapped
If you want to add a second task to use with nfc tags tap the + above

You can set up any tag as a 'switch' so that it will perform alternating actions when scanned.


18:09
Plugins
Tag re-use
Re-use read-only or tags that are not fully supported by your device.
Call
This will allow the Call action to place a call directly rather than open the dialer with the number pre-populated.
SMS
This allows the Text Message action to automatically send a text message rather than pre-populate the SMS data in your text message app.

There are a few handy plugins available for Trigger.

around – for example, your credit card – by installing the 'Tag re-use' plugin from the Plugins menu. Just set up a task as usual, then tap the read-only tag on the phone when it asks you to write it. Rather than writing to the tag (which isn't possible) Trigger will instead note the tag's unique ID, and trigger the specified task whenever that ID is scanned. Note that this means that if a friend scans that tag, nothing will happen.

Secure your iOS device

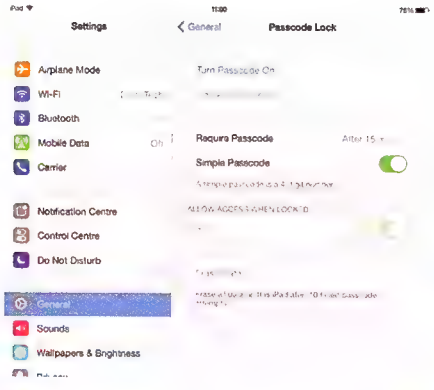
Protect your data and prevent others using your iOS device.

While it's great having fast and easy access to all your contacts and personal information wherever you are, the flip side is that it could be a disaster if you lose your iOS device.

The simplest precaution you can take to protect your data is to set a passcode, so that the iOS device requires you to enter a four-digit code each time you wake it up. If that sounds like too much hassle, you can change the Require Password setting so that if you unlock your iOS device within a specified time of locking it – 15 minutes, say – then you don't have to re-enter the code, but this is obviously less secure.

On the other hand, if a simple four-digit code doesn't sound secure enough for you, you can opt instead for a harder-to-crack case-sensitive password, which can include numbers and any symbols you can possibly type. There's even a nuclear option: go to 'Settings > General > Passcode Lock' and switch on Erase Data. Now, if the passcode is entered incorrectly ten times, all your data and media will be erased and the iOS device will be reset to the factory settings.

Lock it down



1 SET PASSCODE

Go to 'Settings > General > Passcode Lock' and tap 'Turn Passcode On'. Enter your passcode — but make sure it's something you'll remember: if you enter it incorrectly more than six times, you'll be locked out and your only option will be to wipe it and restore.

2 HOLD FIRE

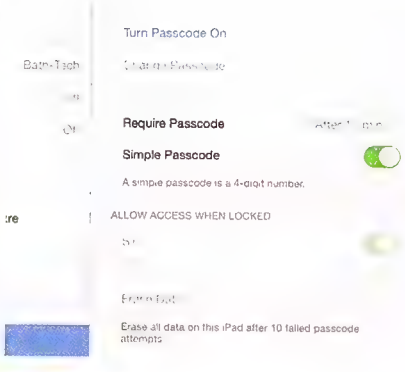
Optionally — if, for example, you regularly unlock your iOS device to respond to a number of tweets in a short space of time — you can tap Require Password and select a delay period before your passcode is required again. Do note though that longer periods mean less security.

3 MORE SECURE

Anyone with enough time will be able to get around a simple four-digit code. If you're serious about security, slide Simple Passcode to off. You can now set a longer string of numbers or a real password complete with capital letters, numbers, punctuation and special characters.

4 RESTRICTIONS

You could consider delving deeper into protecting your iOS device by setting up Restrictions. These can be fine-tuned for every element of iOS device use, from allowing access to Safari to the ability to delete an app.


Turn Passcode On
Require Passcode
Simple Passcode
A simple passcode is a 4-digit number.
ALLOW ACCESS WHEN LOCKED
Erase all data on this iPad after 10 failed passcode attempts

5 SECURE SIRI

Oddly, even if you set a passcode, it turns out that Siri can by default still be used without entering the code, so anyone could make calls, send texts, etc. To plug this hole, tap 'Settings > General > Passcode Lock', and slide the switch for Siri off so that Siri can't bypass the passcode.

6 REMOTE WIPE

As a precaution, install Find My iPhone. Then, if you lose the iOS device, you can use any computer to log in at **icloud.com**. Click Find My iPhone, then the blue icon next to the name of the iOS device, and you can lock it remotely or, if you've given up on finding it, even wipe it.

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TL-4020

$1299

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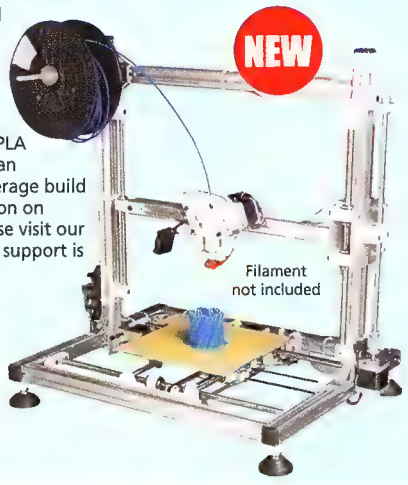

3D Printer LED Light

Illuminate your object whilst printing. Suitable for TL-4020.

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TL-4062	3.00mm PLA	$44.95
TL-4070	1.75mm ABS	$42.95
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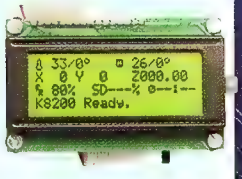
3D Printer Controller Module

Allows you to operate your TL-4020 without a PC! Features an SD slot for file loading, preassembled but cable connection requires soldering.

TL-4022

$149

Note: You will still require a PC to slice and prepare the 3D file.



Arduino Experimenter's Kit

Learn about the exciting new world of Arduino! Extensive starter kit with servo motor, lights, buttons, switches, sound, sensors, breadboard, wires, Freetronics Eleven Arduino compatible board and more.

- No soldering required
- Comprehensive instructions included

XC-4262

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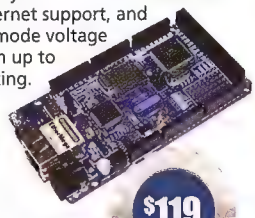
The ultimate network-connected Arduino-compatible board: combining an ATmega2560 MCU, onboard Ethernet, a USB-serial converter, a microSD card slot for storing gigabytes of web server content or data, power-over Ethernet support, and even an onboard switchmode voltage regulator so it can run on up to 28VDC without overheating.

- 10/100base-T Ethernet built-in
- 54 digital I/O lines
- 16 analogue inputs

XC-4256

$119

Also available: Mega Prototyping Shield to suit XC-4257 $17.95



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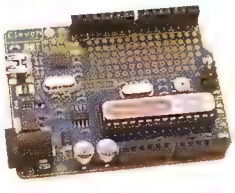
The "Eleven" is just like an Arduino Uno - but better! It's a microcontroller board based on the ATmega328 with 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analogue inputs, a 16MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button.

XC-4210

$39.95



Universal Dual Band Wi-Fi Extender

Eliminate Wi-Fi dead zones and extend the range of existing networks around your home or office. Works with both 2.4GHz & 5.0GHz routers.

- 802.11n
- WEP, WPA-PSK, WPA2-PSK encryption
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- Mains powered
- User access control
- WPS (Wi-Fi Protected Setup)

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3 Port Ethernet Adaptor

Extend your home/office network over the mains power line. Simply plug the adaptor into a mains outlet then connect to your router. Features 3 x 10/100Mbps RJ-45 ports.

- Energy saving mode if no data is transmitted
- Works up to 300m
- Data transfer rate up to 500Mbps

YN-8354

Note: Always plug the adaptor into a single socket. Do not plug into power board or UPS.

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- 4 x RJ-45 Fast Ethernet LAN ports
- WPS (Wi-Fi Protected Setup)
- WEP, WPA & WPA2 encryption

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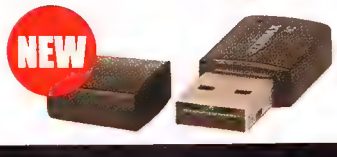

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Adapt a recorded macro

Helen Bradley explains how to shortcut your coding by recording a macro then adapting it.

When you are unsure of the commands to use in an Excel macro you can get Excel to do the work by recording a macro to perform the task. Then simply adapt the code to your needs. This month we'll show you how to record a macro and how to customise it to so it works for every situation.

OUR SCENARIO

For this example we'll look at a worksheet in which new data is added every day and which uses conditional formatting to analyse the data. While you could prepare the worksheet with the formatting in place and paste in the data as values, chances are that occasionally you'll forget to do this and you'll overwrite the formatting. Instead you could choose to paste the data using the Paste command or Control-V and then apply the conditional formats to that data.

The problem then becomes how do you copy and paste conditional formatting because there is no special Excel command to do this. One solution is to record the steps as a macro and then adapt the results.

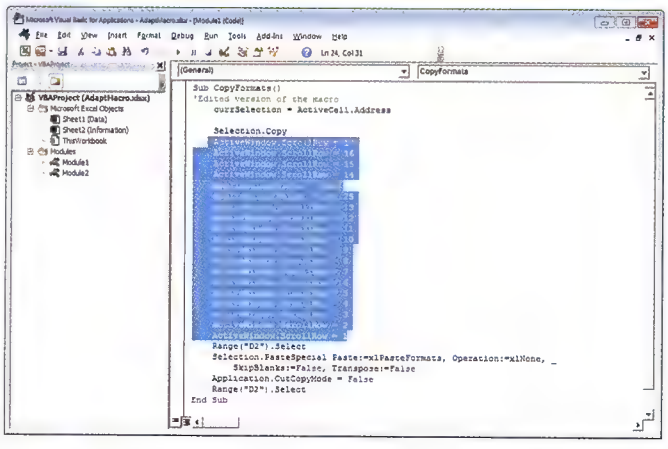
To do this, display the Developer toolbar by selecting 'File > Options > Customize Ribbon', enable the Developer checkbox and click OK. Select the Developer tab.

Create a worksheet that has data arranged by day in columns and which has a conditional format applied to it. Our format compares today's data with yesterday's and colours it one colour if today's is larger and another if today's is smaller. If there is no change then no format is applied.

To record the macro, click in the topmost cell of the column for a new day's data. Click 'Start Recording', type a name for the macro and choose to store it in this worksheet. As your steps are being recorded, select the column to the left of the current cell, click the Format Painter icon, and then click the originally selected cell to paste the format to that column. Click 'Stop Recording'. Click the 'Developer tab > Visual Basic Editor' and open the Module containing the recorded macro. The step by step explains how to remove unnecessary statements and how to adapt it to work for any column of data. Your code may be slightly different but the basics are the same.

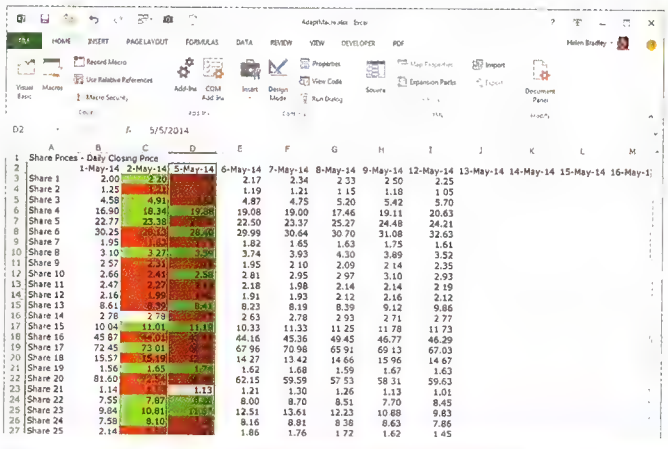
Adapt the macro

Tailor your macro to do what you like.



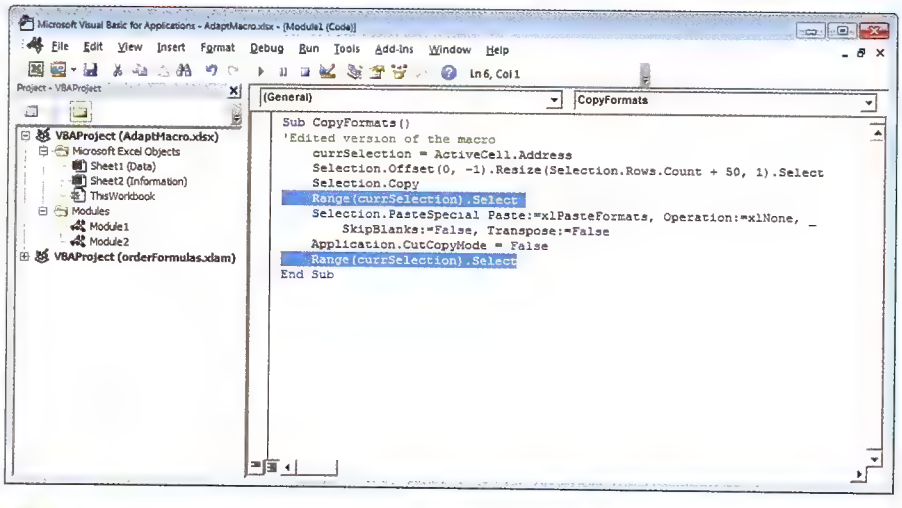
1 CLEAN UP THE CODE

Delete any statements which relate to movement around the worksheet. In order that the macro works for any day, insert a statement that records the currently selected cell in a variable: urrSelection = ActiveCell.Address



2 ADJUST THE CODE TO SUIT

Use an Offset statement to select the cells in the column to the left. Our statement selects 50 rows so adjust the value to suit your data: Selection.Offset(0, -1).Resize(Selection.Rows.Count + 50, 1).Select



3 FINISH IT OFF

Before the statement which pastes the formatting, add this statement to reselect the originally selected cell, (add it again at the end of the macro so the cell pointer returns to its original position) : Range(currSelection).Select

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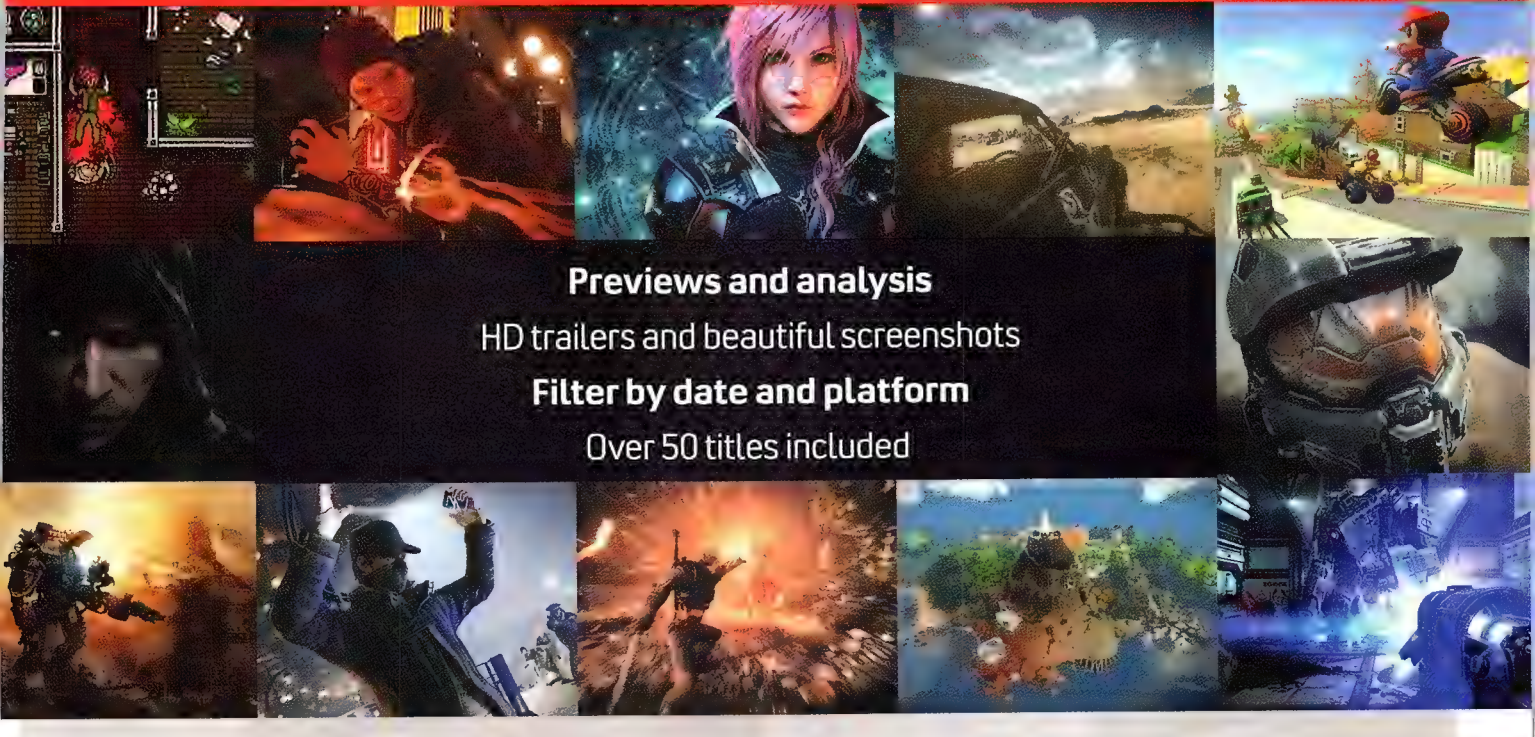

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Build a budget AMD gaming PC

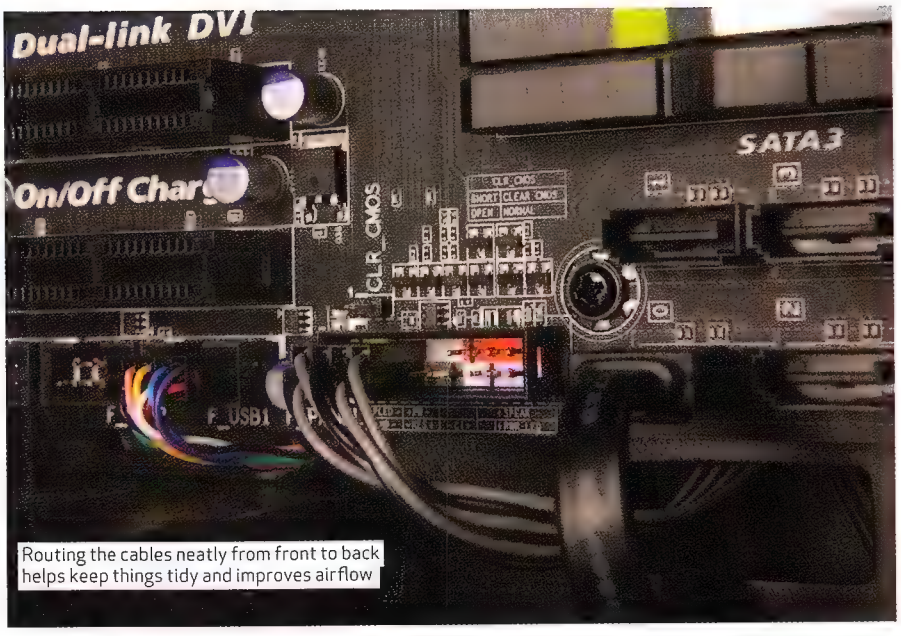
AMD's Dual Graphics (aka Hybrid CrossFire) lets you pair an APU with a GPU for improved performance, so Josh Norem took it for a spin with a Kaveri APU and a budget GPU.

The mission. We've already written quite a bit about AMD's third-generation APU family, known as Kaveri. It's a CPU with an integrated GPU, just like with Intel's Core i7 parts that contain HD Graphics. The difference is that in the past, AMD paired a relatively weak GPU with the CPU, for predictably lame results. This time around, however, AMD has stepped it up a notch, and put the GPU on equal footing with the CPU, sticking an R7-series GPU inside the package, which is a bit more powerful than anything Intel has on tap these days (on the GPU side, that is). Also, since AMD makes both CPUs and GPUs, it can one-up Intel by letting both pieces of silicon work together in a partnership dubbed Dual Graphics, which used to be known as Hybrid CrossFire. It's a dual-GPU setup combining integrated and discrete graphics, and it could be a good way to give your integrated graphics a healthy boost, or it could be a total waste of money. This month, we decided to build a budget-oriented gaming machine to find out for ourselves what Dual Graphics is all about, and to see whether it's actually useful, or just marketing BS.

PREPARING TO DUAL

All you need to build a machine that uses AMD Dual Graphics is the right APU and GPU, and naturally, AMD has a list of compatible and recommended pairings on its web site. The selection is actually quite limited, and when we asked AMD what criteria it uses to deem a particular APU and GPU "compatible," the response was, "We test the different configurations and the best user experiences based on smoothness and performance are listed as the recommended pairing." The company noted, "similarity in outright performance but also configuration" as the main criteria, and listed the A10-7850 and R7 250 as a perfect example, since both have 8 GCN units, the same memory bus width, and similar clock speeds. Due to this recommendation, we decided to use it for this particular build. With the A10-7850 selected, we decided to plop it into a Gigabyte G1.Sniper A88X motherboard, since it's a top-shelf gaming board, supports Dual Graphics, and has dual PCIe x16 slots in case we want to add a baller GPU or two some day in the future. This is a budget machine with modest power requirements, and our discrete GPU doesn't require a six-pin power connector, so we opted for a 430W Smart PSU from Thermaltake, which is the wattage we consider the minimum for a gaming box. Storage duties are handled by an Intel 335 Series SSD, which is SandForce-based. It's not the fastest SSD on the bench, but it's reliable and affordable. Since it's a budget box, we stuffed it all into Antec's newest entry-level military-themed chassis, the GX700. It's similar to the Corsair C70, but half the price.

There's no plans to overclock this machine, so a stock cooler is the simplest (and cheapest) option.



Routing the cables neatly from front to back helps keep things tidy and improves airflow

CASE WORKING

Building in the GX700 was refreshingly painless, thanks to a roomy interior, large grommets for cable routing, and plenty of room to work. Since we weren't planning on overclocking our A10-7850 APU, we went with the simplest cooling option available to us — a stock AMD cooler. These coolers don't look so hot, but they do a great job of keeping the CPU cool, and they operate quietly. Its small size also makes connecting things around the CPU socket a walk in the park. We did splurge a bit on the RAM, though, going with 8GB of Corsair Vengeance with extra-tall heatsinks. These guys are a tiny bit more expensive than the LP sticks with the low-profile heatsinks on them, but either one would work.

HIDING WIRES

One of the building tricks we like to use, if you can call if that, is to stick all the power cables that come from the front of the case to the back of the chassis, and then let them poke out right where they are connected. This keeps the interior uncluttered, and theoretically improves airflow around the power supply, since the cables aren't arranged in a rat's nest at the bottom of the chassis. We like the space between the SATA ports on this motherboard, too, and the fact that they are on the bottom of the motherboard instead of along the edge like they usually are. Anyone who has installed a slightly long GPU knows what a PITA it can be to access those ports with a GPU covering that area of the motherboard. We also like the fact that there are eight SATA 6Gbps ports on this motherboard instead of six you get with a Z87 motherboard.

The red switch controls up to four fans.

GIVE ME THE CODE

Probably the most glaring nod to this case's military theme is the yellow-and-black striped cover that sits on top of the case. Lifting this cover exposes a red switch, which is actually a fan controller that can handle up to four fans. Three fans are already in the case, with two 140mm units up top where a radiator could reside one day, and one 120mm rear fan exhausting heat. You can also install up to two 120mm front intake fans, and one 120mm fan on the side door to help cool the GPU. Next to the fan controller are four USB ports — two USB 2.0 and two USB 3.0—and headphone and mic jacks.

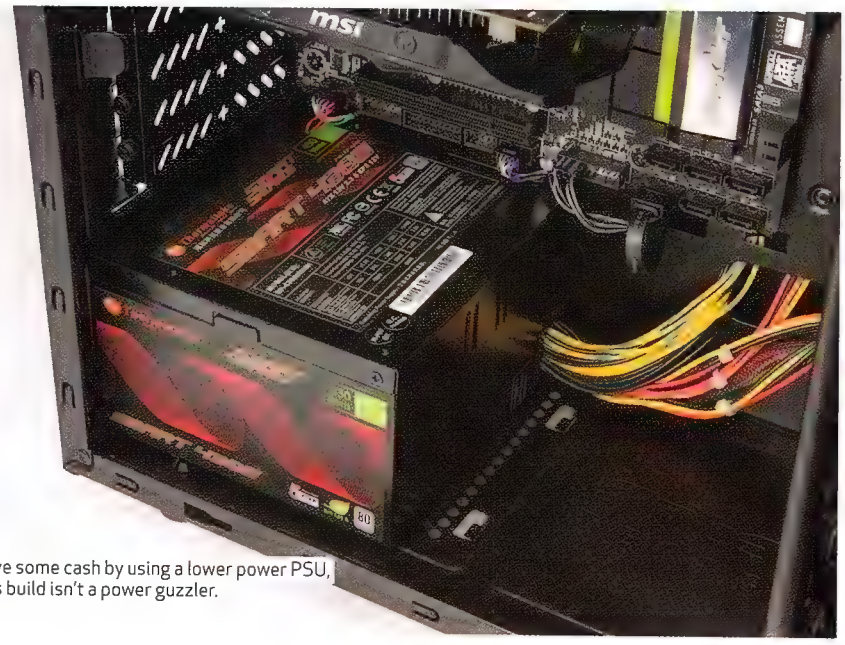
THE BAD NEWS

Maybe we're spoiled, but we're used to just pressing down on a front filter like this one and having it pop away from the case for easy removal. On this chassis, though, the metal grill that covers the front air filter is attached via four thumbscrews. You can loosen the screws with your thumbs just like their name implies, but we found we had to use a screwdriver to get them all the way out. Once removed, the air filter is held in place by clips, reminding us of this case's rock-bottom price tag of just $79. There are no free lunches, so saving money on a PC build means you lose a few amenities, such as tool-less filter covers. To install a 120mm fan, you'll need to remove the entire front cover, which can be lifted away with a bit of effort.

MORE BAD NEWS

Here's another odd design choice from Antec: these weird metal clips that hold the covers on the 5.25-inch bays. When you pull the clips out of the way, the cover loosens and falls right out of the slot. Both the clips and the way the covers tumble out when free felt extremely cheap. Plus, the top drive bay is blocked internally by all the cabling that dangles down from the top-mounted USB and fan controller cables, so you can't put an optical drive in that particular slot, but you could put in a card reader or something similar. The mechanism that holds the drives in place is toolless, however, so you just need to slide it to lock the drive into place. It's not the most sturdy design, but it worked well enough for our needs. Just below the 5.25-inch drive bays there is a vertical cage made of metal that holds five drives in either 3.5- or 2.5-inch form factor. You need to install drives from the right side of the case, however, as the mechanism that releases the individual drive bays resides behind the cage.

The thumbscrews mean the chassis isn't quite as easy access as we'd like.



Save some cash by using a lower power PSU, this build isn't a power guzzler.

The drive clips and covers feel a bit flimsy.

COOL UNDER PRESSURE

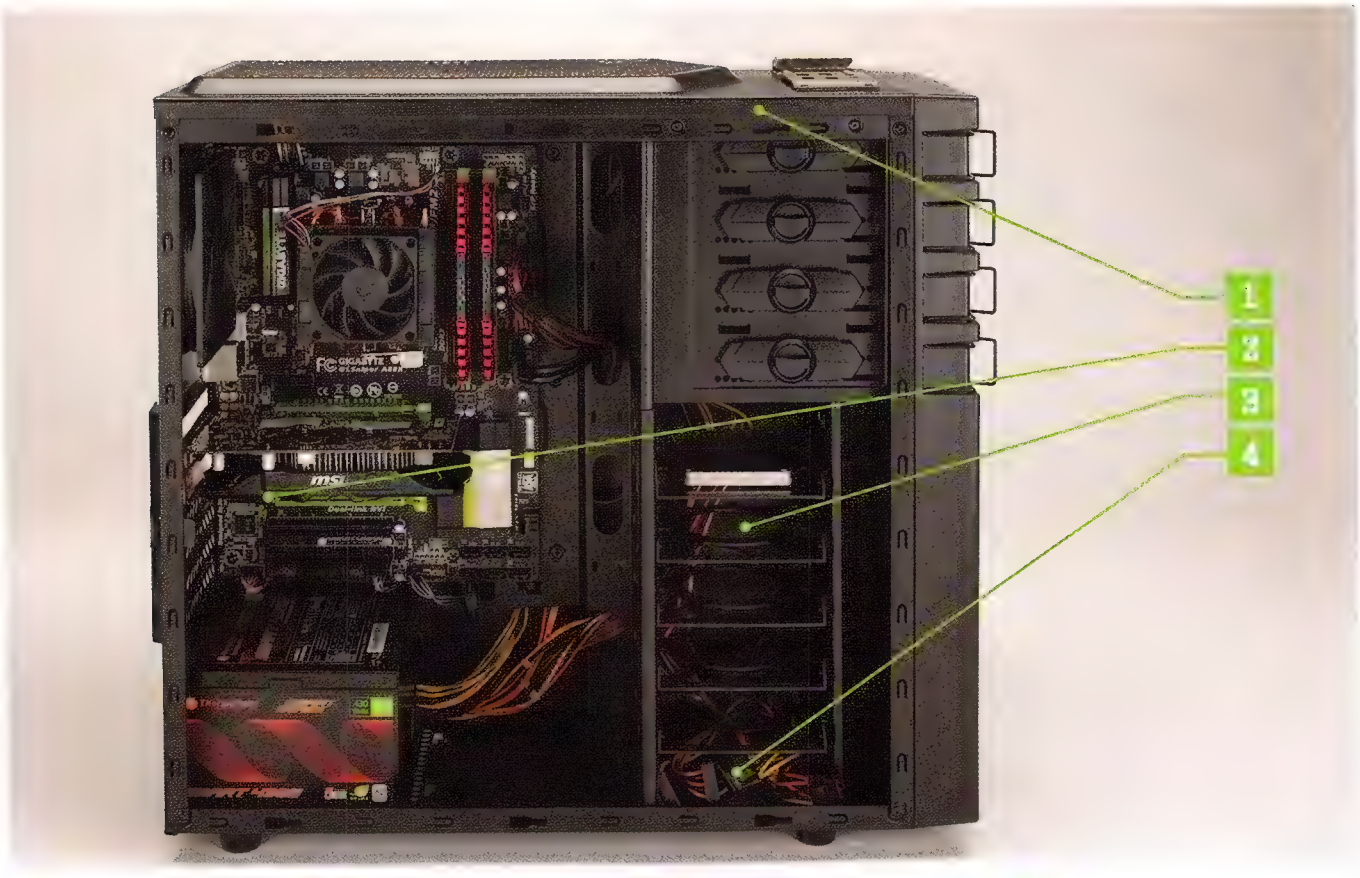
We'll be honest: When we first configured this build, we slotted a 650W PSU into the bottom of the chassis because, well, this is *APC* and that's how we roll. Upon reflection, however, we realised that was a bit of overkill, especially since we had one SSD, no optical drive, and didn't need any power for our discrete GPU. Since we always tell people not to buy more PSU than they need, we decided to take our own advice and swapped it out for a 430W unit from Thermaltake. We've used its PSUs in our GPU testing machine for the past two years with no issues, so it's a brand we generally trust. The area below the PSU is well-ventilated, and includes a filter that is easily removable, too. It sticks out a tiny bit behind the chassis, so you just have to pull it out as if you were sliding a card out of a deck, give it a good wash, and slide it back into place. You can also see that we could have fit a slightly larger PSU into this area.

A GOLDEN TRIANGLE

The purpose of this build was to find out how the addition of a second GPU to a Kaveri APU machine worked, and to see whether or not it was worth the money. Once our rig was built, we added the $110 R7 250 GPU, and then tested both the GPU by itself, and then paired with the APU.

Once the system was humming along, enabling Dual Graphics was as simple as ticking a box in the Catalyst Control Center, much like you would do if you were enabling regular CrossFire with two discrete GPUs.

To put it through its paces, we ran our test suite at 1080p with all settings maxed out, but no AA because that's just a bridge too far for these cards. With Dual Graphics enabled, we were surprised to see performance go up as



1 The GX700 case includes two 140mm fans up top, and there's room for a 240mm radiator, as well.

2 Unlike with regular CrossFire, no cable is needed to connect the GPUs for Dual Graphics; it's all done through software.

3 The hard-drive cage holds five drives and is not removable, but features plastic caddies that hold either 3.5-inch or 2.5-inch drives.

4 There wasn't enough space between the back of the case and the motherboard tray to stash our extra PSU cables, so we shoved them down here.

much as it did, which was around 40 to 50% in most titles that were able to use both GPUs.

That is damned impressive, and more than we expected. The problem, of course, is that the overall numbers were still really low despite two GPUs working together. When we tested the R7 250 last year, we noted that it couldn't quite do 1080p with all settings maxed, but we hoped the addition of the second GPU would allow us to overcome that challenge. Unfortunately, it's not enough, so any of these low-end cards are not ready for 1080p gaming – they're better suited to 720p or 1050p.

The bigger question here is if you were running a Kaveri box and decided you wanted to add more GPU muscle, what are you going to do? We can say definitively that if you want to really increase performance, you should just buy a discrete GPU like the R7 265 and forget about integrated graphics, or sub-$100 GPUs because they generally suck, at least if you are like us and used to gaming with all details enabled. It's possible that over time, AMD will work to improve the scaling between the two GPUs in Dual Graphics, so instead of seeing gains around 40%, we'll see it more around 75%, like it is with two discrete cards.

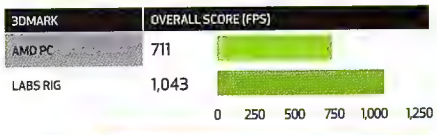
With all that said, we were impressed by both how easy it was to set up Dual Graphics, and that we saw a very noticeable gain in almost all of our test games. We don't think the combination of two weak GPUs is enough to provide a decent gaming experience, though, so in the final analysis, we'd rather just use a more powerful discrete GPU.

PARTS LIST

CASE	ANTEC GX700	$79
PSU	THERMALTAKE SMART 430W	$89
MOBO	GIGABYTE G1.SNIPER A88X	$145
CPU	AMD A10-7850K	$215
COOLER	STOCK	$0
GPU	MSI RADEON R7 250	$110
RAM	2X 4GB CORSAIR VENGEANCE	$125
SSD	INTEL 335 SERIES240GB	$230
OS	WINDOWS 8.1 64-BIT OEM	$129
TOTAL		$1,122

BENCHMARK RESULTS

Gaming performance (synthetic)



Gaming performance (real world)

*The Labs Rig compared here consists of a 3.2GHz Core i7-3930K and 16GB of Corsair DDR3/1600 on an ASUS P9X79 Deluxe motherboard. It has a GeForce GTX 690, a Corsair Neutron GTX SSD, and 64-bit Windows 7 Professional.

Project #18 – Digital Audio Recorder – Part 2

This month, Darren Yates finishes off the Digital Audio Recorder with new software enabling higher sample rates.

Last month, we introduced our Digital Audio Recorder by looking at the basics of timer interrupts and how the Arduino Uno's ATMEGA328P controller can be programmed to create precise timing intervals ideal for audio sampling. We also looked at the 'double buffering' technique that allows us to simultaneously record samples and save data to the flash card every 45 microseconds.

Well, a month is a long time in tech and we've made some major changes and improvements – including boosting the sample rate maximum from 22.05kHz to as high as 48kHz (reliant on the microSD card). We'll explain how, but first, we'll look at the FAT filesystem and how we implemented Microsoft's WAV file structure to enable the recorded file to play almost anywhere.

FAT FILESYSTEM

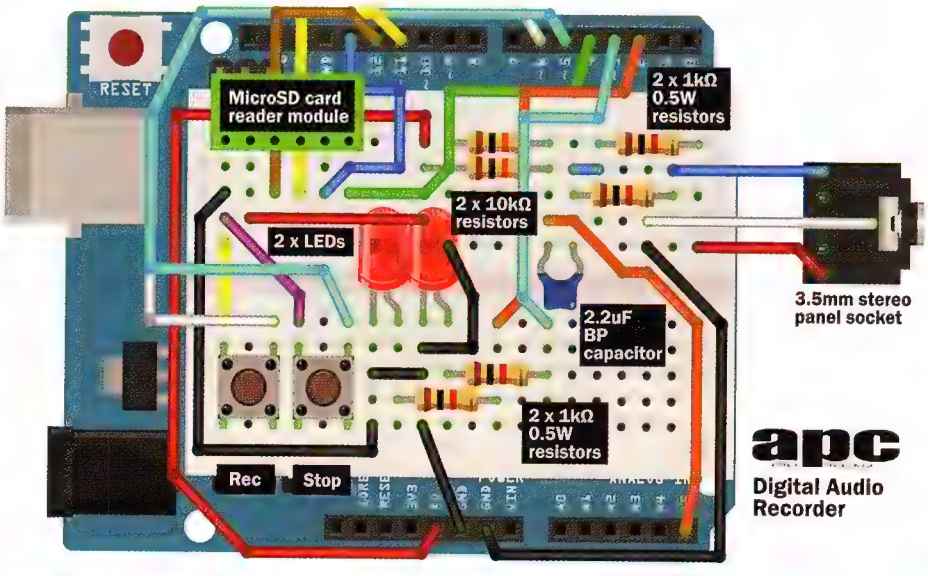
Like many audio file formats, WAV has a structure designed so that when the file is loaded into any suitable media player, it knows how to play it. Otherwise, the file is just random data. The key is the initial 44-byte data block known as the 'WAV file header', which identifies the file and holds important information on the sample size, bit depth, number of channels and so on. This is what our recorder must create as it begins recording.

Last month, we looked at the microSD card interface and basic flash card storage alignment, but before we get to creating the WAV header, we first have to understand how data is arranged on and written to the card.

Every storage device needs a file system, a way of knowing what's stored where and arguably the most common is Microsoft's File Allocation Table filesystem or FAT. Arduino supports file storage with the SD library using FAT16 or FAT32 structures, but to improve performance, we're using the new-and-improved sdfatlib library (**code.google.com/p/sdfatlib/**).

There are two standard ways to write data to storage – you can write it as ASCII text, where each character requires one byte of storage; or you can write it in more efficient binary form. To write a WAV file, we need this second form, but before we can get started, there are other limitations we need to get around.

If we look back at the WAV file header, it contains small memory blocks with each one defining a parameter of the audio inside, whether it's the sample rate, file size, bit depth or so on. Some of those blocks are two-bytes wide, most are four-bytes. The problem we have with the sdfatlib library is that while it supports both ASCII and binary writing, it can only write in binary format one byte per command, so before we can write these WAVE blocks as datatypes, we have to convert them to bytes and write them to the card one byte at a time.



The overlay diagram for our recorder project.

Microsoft WAV file header

Offset	Size	Field name	
0	4	ChunkID	'RIFF' in ASCII bytes
4	4	FileSize	<written on file close>
8	4	Format	'WAVE' in ASCII bytes
12	4	SubID	'fmt ' in ASCII bytes
16	4	SubSize	Set to '16' for WAV format
20	2	AudioFormat	Set to '1' for PCM audio
22	2	Channels	Set to '1' for mono
24	4	SampleRate	Set to '32000'
28	4	DataRate	Set to '32000' bytes/sec
32	2	BlockAlign	Set to '1' (bits/8 x channels)
34	2	SampleBits	Set to '8' (bits per sample)
36	4	SubID2	'data' in ASCII bytes
40	4	Sub2Size	<written on file close>
44		AudioSamples...	

We implement Microsoft's WAV file format using this 44-byte header.

WAV FILE FORMAT

So let's go back to the WAV file format and that 44-byte header. The wave header is written to the card in the writeWavHeader() method with the basic structure you can see in the block diagram (above). Here it is in detail,

Where to find the sketch source code

As usual, you'll find the source code for our Digital Audio Recorder at our Arduino webpage at **apcmag.com/arduino.htm**. While it has been tested, the code comes 'as is' with no warranty of any kind.

starting with the file ID:

Offset 0 (4 bytes length) — ChunkID. This contains the four ASCII characters 'RIFF' (Resource Interchange File Format) and identifies the file.

Offset 4 (4) — FileSize. The overall size of the file, the four bytes (32-bits) gives us a 4GB maximum filesize (written after the recording is completed).

Offset 8 (4) — Format. The four ASCII characters 'WAVE' indicate standard WAV format.

The next 24-bytes tell us specific parameters of the audio:

Offset 12 (4) — SubID. This contains the characters 'fmt ' (including the space).

Offset 16 (4) — SubSize. Sets the size of the data chunk to 16-bytes for PCM wave format.

Offset 20 (2) — AudioFormat. Although we use four bytes here, this is set to 0x0001 indicating non-compressed PCM/WAV audio follows.

Offset 22 (2) — Channels. The number of audio channels (in our case, one).

Offset 24 (4) — SampleRate. The audio sample rate, written as binary.

Offset 28 (4) — DataRate. Sets how fast data needs to be streamed and is calculated by the equation: DataRate = samplerate x channels x (bitspersample / 8)

Offset 32 (2) — BlockAlign. Indicates how the audio data is aligned, so that the player knows which bytes belong to which channel.

Offset 34 (2) — SampleBits. The number of bits in each sample (we set this to '8').

The last 8-bytes set up the rest of the file:

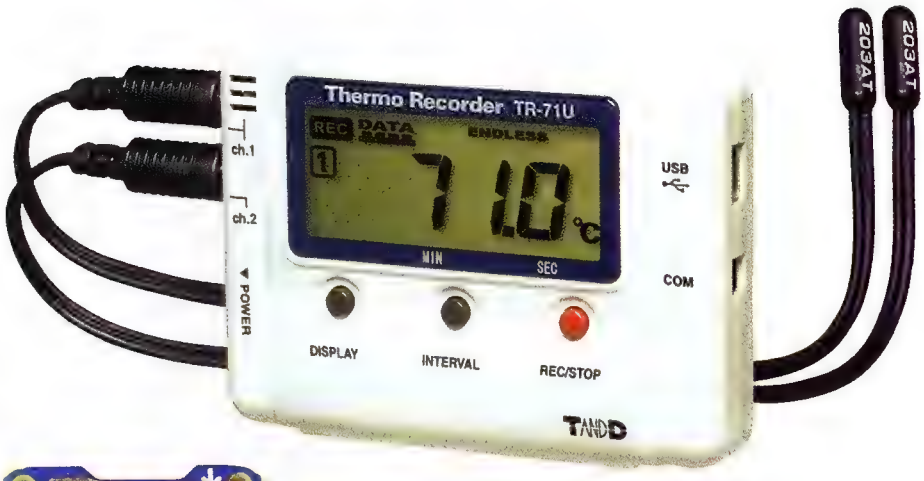
Offset 36 (4) — SubID2. This contains the ASCII characters data indicating the audio data begins here.

Offset 40 (4) — Sub2Size. The size of the audio data following, set by the equation: Size = no. of samples x no. of channels x no. of bytes per sample.

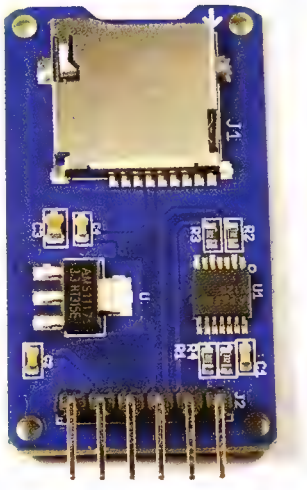
Again, this is written after recording is completed.

Having to write these datatypes a byte at a time means the order of each byte stored (called the byte order) is critical; otherwise, a datatype of '1' may end up becoming '16777216' if we're not careful. Another thing we must do is keep track of the number of samples we capture, so this info can be written back to the file header after the capture is completed.

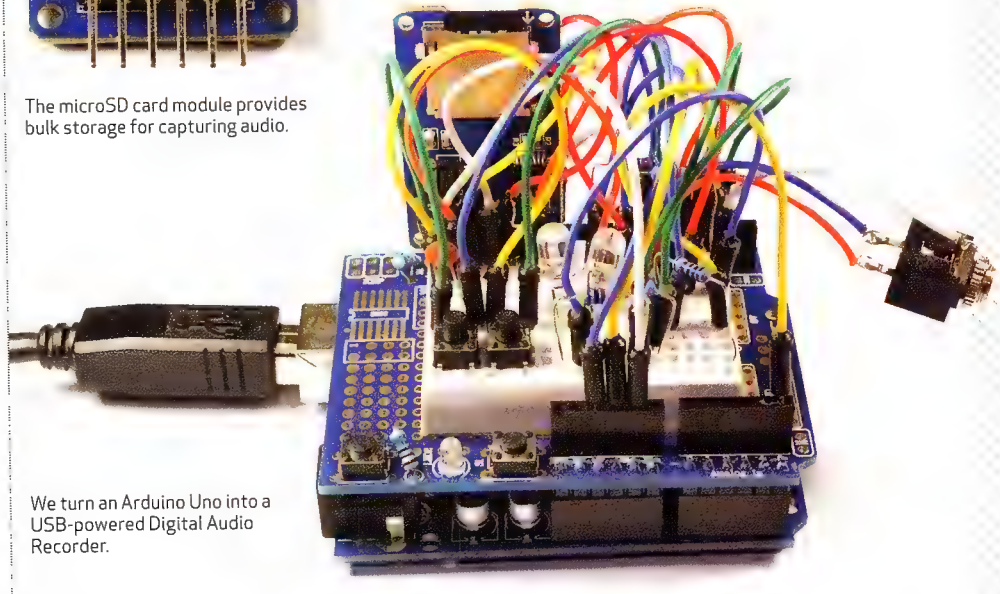
There's a lot to do so here's how it's done — first, the only header info we don't know is the filesize and data chunk size, so we start the recording process by opening up the file 'REC00000.WAV', write the file header info we do know and dummy-fill the spots we don't. Once that's done, we start capturing the audio and storing it away. Since each sample is one byte (8 bits), the number of samples we capture is also the number of bytes we store. We keep track of this number in a long-integer variable called 'byteWriteCount', which is incremented every sample.



Data loggers are used in many applications, including environmental.



The microSD card module provides bulk storage for capturing audio.



We turn an Arduino Uno into a USB-powered Digital Audio Recorder.

When we stop capturing, we use the sdfatlib's 'seekSet' command to go back to the file header, write in the filesize and datasize information and finally, close the file.

After all that is done, the file on the card is now a genuine WAV file playable on any compatible device, including phones, tablets and Windows Media Player on your PC or notebook.

CONTROLLING THE RECORDER

To keep things really simple, our digital audio recorder has just two buttons — Record and Stop. The Arduino continually monitors two of its digital input lines (D5 and D6) and when the Record button (D6) is pressed, the recording function begins. When the Stop button (D5) is pressed, we deactivate the timer interrupt that launches the interrupt service routine (ISR) capturing the samples, write out the information to the WAV file header and close the file.

To give you some basic indication of what the recorder is doing, two LEDs light up, one for 'recording' and the other for 'stopped'. Any problem with the card on boot results in the LEDs flashing.

CIRCUIT DESIGN

We've used the Arduino DIY prototyping shield to house the microSD card module,

buttons, LEDs and audio input circuitry. It's a tight squeeze but keeps things compact. Again to simplify things, the audio input circuit just contains a resistor divider to bias the ADC input to half the supply rail – this ensures that we accurately capture the positive (samples 128 to 255) and negative (samples 128 to 0) halves of the audio waveform. You'll need to feed it with a high-level audio input from your PC's line output level or phone/tablet's headphone socket. We've used a 3.5mm panel socket here and a 3.5mm male-to-male cable will connect those devices to the recorder.

MODIFYING THE BUFFER

The microSD flash card reader module is a new release you'll find on eBay for around $5 – it supports any SDHC card up to 32GB and contains built-in level translation to convert the 5V signals from the Arduino to 3.3V level for the flash card.

From last month, you'll remember that we're forced to use the microSD card's one-bit SPI (serial peripheral interface) bus rather than the faster four-bit parallel mode, simply because that's all the Arduino Uno supports. We implemented this alongside a double 512-byte buffering system that records samples into one buffer while the other buffer is written to the card.

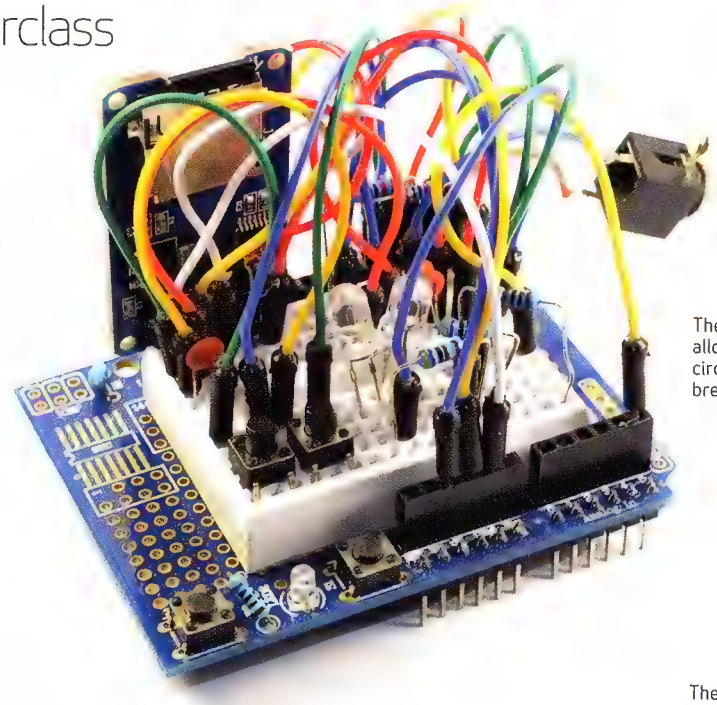
However, we found this month that we were temporarily losing samples after 40 seconds or so of recording. The reason wasn't the recording mechanism itself, but the microSD card's SPI bus speed and how data is written to the flash storage.

With a 22.05kHz sample rate, the two 512-byte buffer blocks each provide 512/22050 or 23.2 milliseconds of audio storage. We benchmarked the write time for 512-byte blocks to the card and on average, it took just three milliseconds (3ms), so there was no problem. Or so we thought.

However, on occasions, we discovered it was taking the microSD card reader as long as 65 milliseconds to write the same-sized block – three times as long as the buffer itself can handle and that's where the samples were being lost.

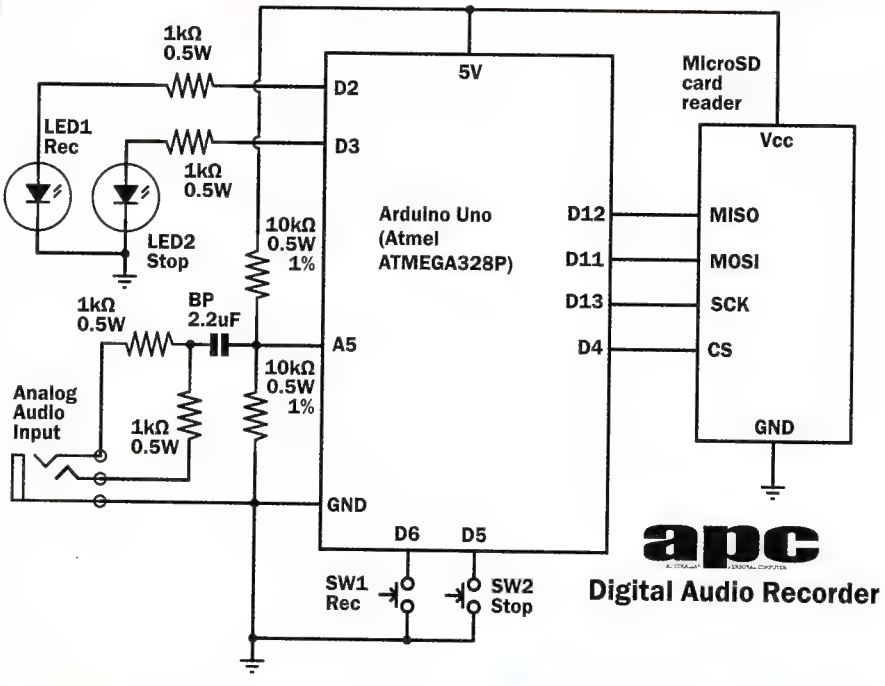
But we also found that if we dropped the buffer size down to 128 bytes, the average write time dropped to just 0.5 milliseconds, with some as fast as 88 microseconds. Unfortunately, the occasional write still took up to 65 milliseconds to complete, but there were far fewer of these.

So the solution was to redesign the two 512-byte buffer blocks into an eight-block ring buffer that still gave us the maximum buffer size but with improved write speeds.



The Arduino DIY shield allows you to build small circuits on a tiny breadboard.

The schematic for our Digital Audio Recorder.

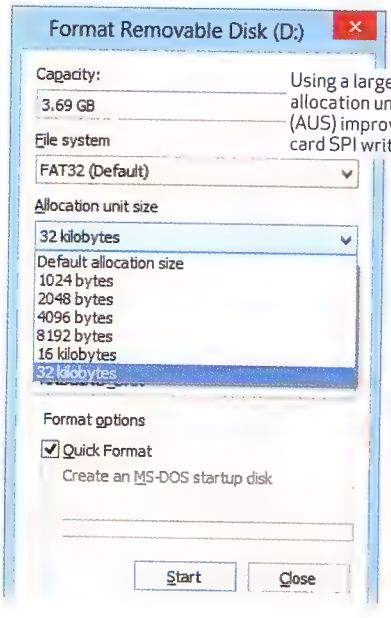


SETTING THE SAMPLE RATE

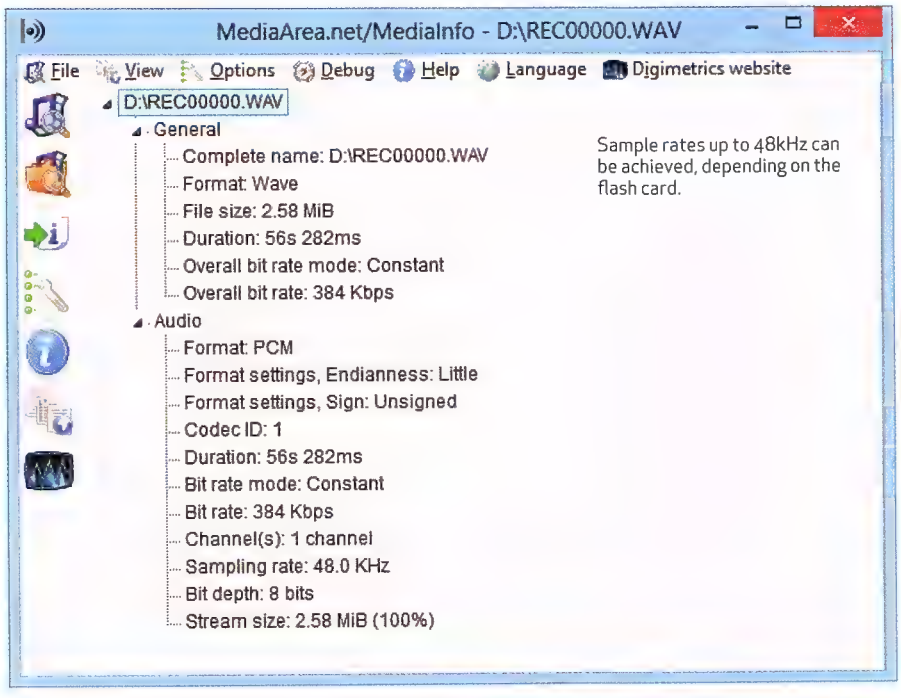
Not only that, the faster performance means we've been able to incorporate an adjustable sample rate, up from the original locked 22.05kHz to as high as you can get away with depending on your microSD card (48kHz maximum). You set it in the source code (it's pretty obvious where) before you flash your Arduino Uno board with it.

Because of variations in microSD cards, the maximum sample rate you can achieve depends more on the card than on the ATMEGA328P controller. We've tested it and captured sample-stable recordings up to 48kHz.

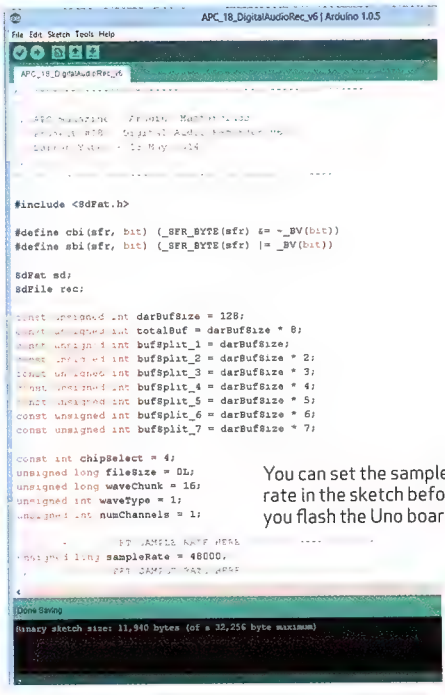
But here's the key – if the card's SPI bus write speed is too slow, you'll hear 'skips' in your recording where samples haven't been written to the card in time. Unfortunately, we can't tell you



Using a large allocation unit size (AUS) improves flash card SPI write speed.



Sample rates up to 48kHz can be achieved, depending on the flash card.


APC_18_DigitalAudioRec_v6 | Arduino 1.0.5
#include <SdFat.h>
#define cbi(sfr, bit) (_SFR_BYTE(sfr) &= ~_BV(bit))
#define sbi(sfr, bit) (_SFR_BYTE(sfr) |= _BV(bit))
SdFat sd;
SdFile rec;
const unsigned int darBufSize = 128;
const unsigned int totalBuf = darBufSize * 8;
const unsigned int bufSplit_1 = darBufSize;
const unsigned int bufSplit_2 = darBufSize * 2;
const unsigned int bufSplit_3 = darBufSize * 3;
const unsigned int bufSplit_4 = darBufSize * 4;
const unsigned int bufSplit_5 = darBufSize * 5;
const unsigned int bufSplit_6 = darBufSize * 6;
const unsigned int bufSplit_7 = darBufSize * 7;
const int chipSelect = 4;
unsigned long fileSize = 0L;
unsigned long waveChunk = 16;
unsigned int waveType = 1;
unsigned int numChannels = 1;
unsigned long sampleRate = 48000;
Done Saving
Binary sketch size: 11,940 bytes (of a 32,256 byte maximum)

You can set the sample rate in the sketch before you flash the Uno board.

which cards are faster since it depends on the card's controller and flash write speed. You have to 'suck it and see'.

However, we've found in general, that smaller-capacity cards formatted with a larger sector or allocation unit size (AUS) seem to offer faster performance in SPI mode. We tested this with 4GB and 8GB cards formatted with 1KB and 32KB AUSs – the 32KB AUS-formatted option delivered faster write speeds all-round. Formatting the card just before use can also make a difference.

WHAT'S IT SOUND LIKE?

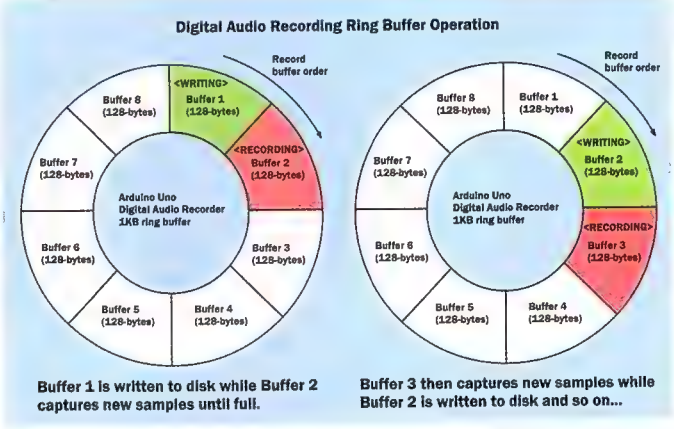
Given how few resources we have, and now with higher sample rates, the audio quality is surprisingly good! With only 8-bit sample depth, the signal-to-noise ratio (SNR) is roughly around 40dB (cassette tape), so there's a bit of background hiss, but if you record audio that has serious dynamic range compression, you don't notice it (ACDC's Back in Black, for example, sounds great).

Sure, it's not CD-quality, but the techniques here are just the same – and that still makes this a seriously good way to learn how digital audio works, from analog sampling through to file storage.

LIMITATIONS

Really, the only reason we run into any issues at all is simply the ATMEGA328P's lack of RAM. The chip is fast enough – it just doesn't have enough RAM to compensate for the occasional few slow card block-writes, but there are ways to solve this.

One simple fix is to reduce the sample rate, albeit at the cost of audio quality. A more complex lossless option is adding external RAM, such as a 23K640 64KB SPI RAM chip. We could also swap the Arduino Uno for the up-rated Arduino Mega2560 with its 8KB of RAM.


Digital Audio Recording Ring Buffer Operation
Record buffer order
<WRITING>
Buffer 1 (128-bytes)
<RECORDING>
Buffer 2 (128-bytes)
Buffer 3 (128-bytes)
Buffer 4 (128-bytes)
Buffer 5 (128-bytes)
Buffer 6 (128-bytes)
Buffer 7 (128-bytes)
Buffer 8 (128-bytes)
Arduino Uno Digital Audio Recorder 1KB ring buffer
Buffer 1 is written to disk while Buffer 2 captures new samples until full.
Buffer 3 then captures new samples while Buffer 2 is written to disk and so on...

The new ring buffer improves card write speeds, enabling higher sample rates.

DIGITAL AUDIO RECORDER - PARTS LIST

COUNT	PART	COST	FROM
1	ARDUINO UNO R3	$15	EBAY, ONLINE SUPPLIERS
1	DIY PROTOBOARD SHIELD	$10	EBAY, ONLINE SUPPLIERS
1	MICROSD CARD READER MODULE	$5	EBAY, ONLINE SUPPLIERS
2	10KOHM 0.5W RESISTORS	$1	JAYCAR ELECTRONICS
4	1KOHM 0.5W RESISTORS	$1	JAYCAR ELECTRONICS
2	2.2UF BP CAPACITORS	$3	JAYCAR ELECTRONICS
1	3.5MM STEREO PANEL SOCKET	$3	JAYCAR ELECTRONICS
2	5MM LEDS	$1	JAYCAR ELECTRONICS
2	PCB PUSH-BUTTON SWITCHES	$1	EBAY, JAYCAR ELECTRONICS
		$40	

OTHER IDEAS

Obviously we are right on the edge of the ATMEGA328P's capabilities here, but slow that sample rate right down and there's an application that's right in the Arduino's wheelhouse – data logging. That data can be anything from weather measurements to a digital voltmeter or even a security system. The ATMEGA328P's 10-bit ADC range means you can capture analog data down to 0.1% of full scale, or you can just record changes on any of the digital inputs.

And that's what makes Arduino so cool – it has so many toys to play with, there's always a new idea just around the corner.

Getting more Xposed

The Xposed Framework is gaining popularity. Darren Yates looks at new modules making custom ROMs almost unnecessary.

HTC's One (M8) ca be modded and improved with the Sense 6 Toolbox.

There's no doubt Android is the most customisable mobile OS on the planet – the tidal wave of custom ROMs available for the ocean of Android devices is testament to that. But with device-specific closed-source drivers still a necessity for most phones and tablets, custom ROMs are only as good as the device drivers they include – no matter how good the tweaks and features on offer.

We looked at the Xposed Framework a few months ago, but it is quickly becoming an indispensable tool for customising your Android device. Rather than having to bake your custom mods into a new ROM every time a new flavour of Android is released, Xposed allows you to implement them in an existing ROM at run-time. It's a cleverly executed system with plenty of promise – for developers, mods are no longer tied to a particular ROM, or depending on the mod, even to a particular device. That instantly opens up a bigger audience to your mod wares. For users, mods are now as easy to install as side-loading or even straight downloading an app from Google Play. And best of all, you get to keep your existing ROM with all of its lovely hardware-specific device drivers. The fact that Xposed allows you to install and remove, turn on and off any number of mods at-will is why it's a killer addition to Android.

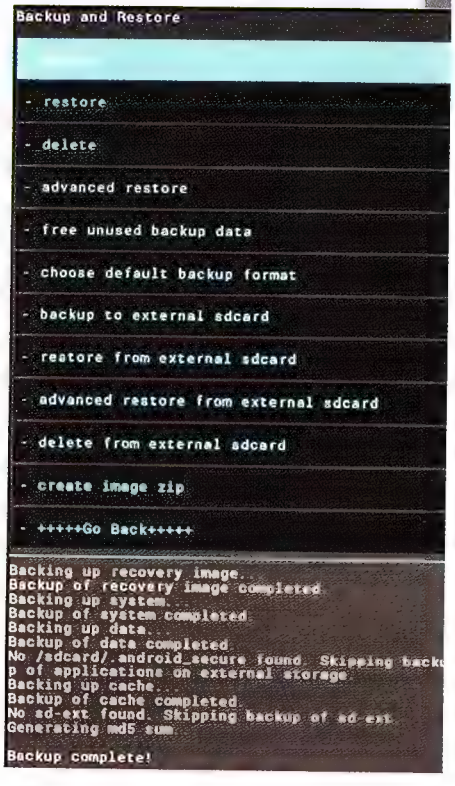
HOW IT WORKS

As its name suggests, Xposed works by exposing an entry point or 'vector' through a small java archive (.jar) file called XposedBridge that runs alongside part of Android's Dalvic run-time engine called Zygote. Through this vector, you can run almost any type of mod you wish. Yep, it increases the security risk of someone doing something nasty with your device, but you basically punched a 100-metre wide hole into the Android security wall when you gained root access anyway.

What's important is that Xposed now has a rapidly growing community of developers and users, so provided you stick to well-known, popular Xposed modules, your chances of things going pear-shaped are greatly reduced. In fact, the community is growing so rapidly that it's now been spun off into its own forum on the XDA-Developers.com web site. You can also search through the latest modules on the forum page at **forum.xda-developers.com/xposed/modules**.

Back up before you Xpose

We say this every time but let's say it again — there are no guarantees with these kinds of mods, so it always pays to perform a system backup before you go installing the Xposed Framework, just in case. Make sure your device has some form of custom recovery and you know how to backup and restore your existing settings and files before you start playing around with Xposed.


Backup and Restore
- restore
- delete
- advanced restore
- free unused backup data
- choose default backup format
- backup to external sdcard
- restore from external sdcard
- advanced restore from external sdcard
- delete from external sdcard
- create image zip
- +++++Go Back+++++
Backing up recovery image...
Backup of recovery image completed.
Backing up system...
Backup of system completed.
Backing up data...
Backup of data completed.
No /sdcard/.android_secure found. Skipping backup of applications on external storage.
Backing up cache...
Backup of cache completed.
No sd-ext found. Skipping backup of sd-ext.
Generating md5 sum...
Backup complete!

Make sure you back up your device before installing Xposed.

INSTALLATION

Xposed just needs Android 4.0.3/Ice Cream Sandwich or later and either an ARM or Intel x86 processor, which covers just about every Android device ever built. The only tricky thing you'll need is root access. We've covered this numerous times (you can read my take on the *APC* web site at **apcmag.com/how-to-root-your-android-phone.htm**) so we won't do it now. Once root access is confirmed, you can download the latest version of the Xposed Framework from **dl.xposed.info/latest.apk**. Don't forget to enable app installation from 'unknown sources' in Android Settings/Security. The Xposed framework itself is not device-dependent, so you should be able to install it on just about anything – it's the modules where you may find some OS or device specific requirements. Just check before you download.

INSTALLING MODULES

The Xposed Framework is just that – a framework. It doesn't do anything on its own. You have to install Xposed modules into the framework before you'll see any change. Some of the more popular modules are now available on Google Play – you just install them in the usual way, except you must grant them root access via SuperSU or SuperUser when requested.

Once they're installed, you head into the Xposed Installer app's Modules list and check the boxes next to the modules you want to run – this also provides a very simple way of turning modules off, too. After a quick reboot, your modules will run as expected.

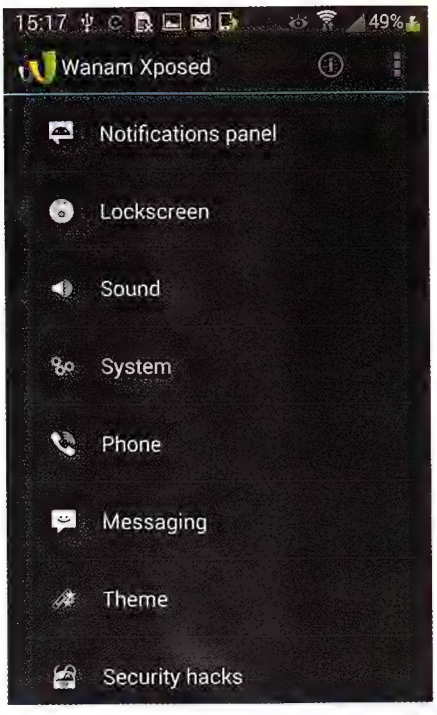
THE BEST XPOSED MODULES

Xposed has gained in popularity over the last six months and the number of modules now available is climbing. Since writing modules isn't any more complex than writing a standard Android app, you'll find modules of all sizes and types – from single function to full user interface customisation options. These are some we recommend you take a look at:

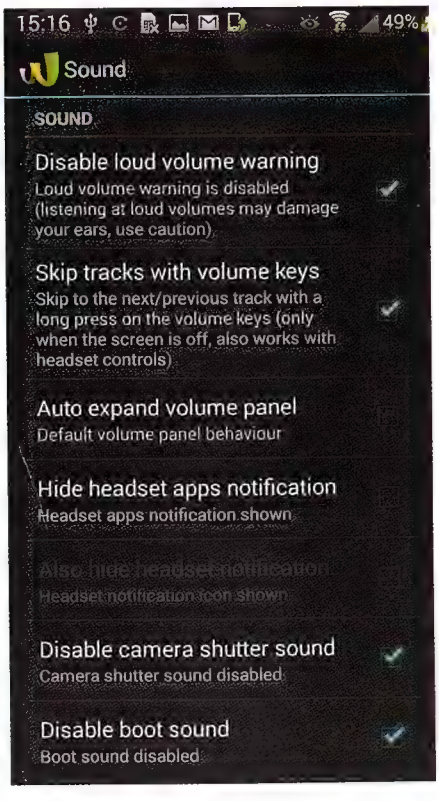
MODULES – SAMSUNG

Wanam Xposed. If ever you want to customise Samsung's TouchWiz interface (among other things), Wanam Xposed is just about the best way to do it. It's jam-packed with a busload of mods – 72 at time of writing – that cover a surprisingly wide function area. Apart from the user interface itself, you can enable screen recording or call recording, disable the camera shutter sound or the boot sound and much more.

As with most large 'mod pack' style modules, chances are you may find something that doesn't work as advertised. That said, we had no trouble with everything we tested using a GT-I9300 Galaxy S3 phone with Android 4.3/Jelly Bean. The only slightly frustrating thing (and this is the case for all modules) is the need to reboot before you mods will be enabled – but that's a damn sight easier than having to flash a custom ROM or mod an app. If you have a Samsung device and you want to give Xposed a try, this



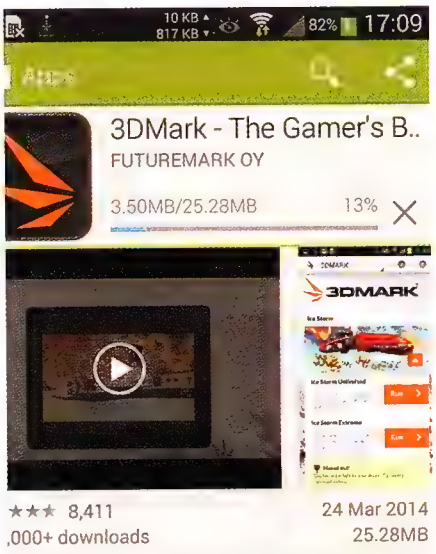
Wanam Xposed is the must-have all-in-one tweak module for Samsung devices.


15:16
49%
Sound
SOUND
Disable loud volume warning
Loud volume warning is disabled (listening at loud volumes may damage your ears, use caution)
Skip tracks with volume keys
Skip to the next/previous track with a long press on the volume keys (only when the screen is off, also works with headset controls)
Auto expand volume panel
Default volume panel behaviour
Hide headset apps notification
Headset apps notification shown
Disable camera shutter sound
Camera shutter sound disabled
Disable boot sound
Boot sound disabled

You can disable shutter and boot sounds within Wanam's list of mods.

The Big Index

Xposed has its own module repository over at **repo.xposed.info/module-overview**, but you'll find much more happening on the XDA Developer's website, including a continually-updated index of the latest modules at **forum.xda-developers.com/xposed/modules**.



Wi-Fi transfer speeds are displayed in the status bar with lots of modifications.

Turning modules on and off in Xposed is as easy as checking a box.

is the first module you should consider.

Requirements: essentially any Samsung device with a stock ROM based on at least Android 4.2/Jelly Bean should be able to use this. As usual, you still need root access to enable the framework to begin with, but nothing else. Available on Google Play. Note: Nexus owners with KitKat/4.4+ stock ROM on board can try the very similar Wanam Kit available on Google Play.

MODULES — HTC

Sense 6 Toolbox. This is the latest release in the popular Sense Toolbox range and only a couple of weeks old at time of writing. It's one of the best ways to customise your HTC device in general and your HTC One (M7) and (M8) phones in particular. Similar to Wanam Xposed, Sense Toolbox allows you to customise various user interface controls from colour themes to hiding icons, adding transparency to user interface elements as well as providing a more advanced power menu. Grab it from **forum.xda-developers.com/xposed/modules/mod-sense-toolbox-answer-to-sense-6-t2733409**.

Requirements: While it should work with stock ROMs, it was designed using the popular Android Revolution HD ROM, a custom effort built on top of the stock KitKat/4.4.2 ROM from HTC.

MODULES – ALL

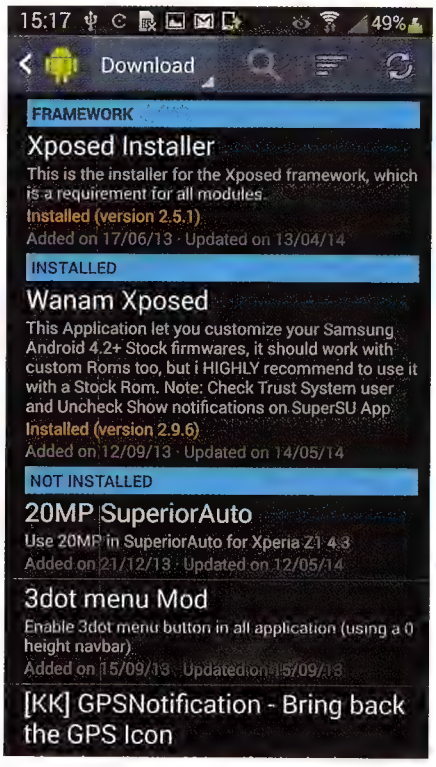
NetworkSpeedIndicator. So who doesn't want to know how fast their phone data transfers are clocking in? This excellent little module will monitor your data traffic – either Wi-Fi, mobile network or both – and display both upload and download speeds on the status bar. If your status bar is already crowded, you can switch it so that it only provides notification when you're actually sending or receiving data. This one isn't available on Google Play, but you will find it over at **tinyurl.com/qerqx5g**. Combine it with WiFi Analyzer on Google Play and find your best download locations.

Requirements: None really – it works on any device the Xposed Framework will run (even the Android 2.3 beta version of Xposed).

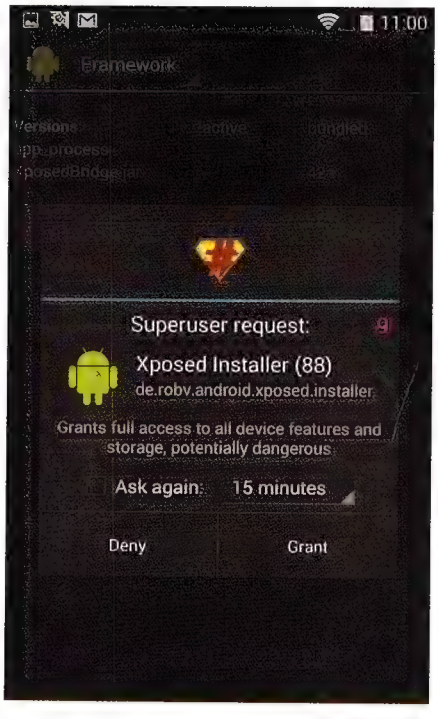
Xposed Torch. OK, I know. There must be a thousand of these apps on Google Play and I should be made to hold my breath until I count every last blessed one of them! The problem with these torch apps though is you have to turn your phone on, find the app icon, launch it and then tap the soft switch. This Xposed Torch module maps to the device's hardware buttons, so your phone can be in sleep mode, you long-press the home button or volume-up button (you choose) and bingo, on comes the device's LED. If you've struggled for your keys at night in the dark, you'll appreciate this easy-to-use alternative. It's written by the same guy who brings you Wanam Xposed and it's available on Google Play.

Requirements: any device that can run Xposed and has a LED flash.

Intelli3G. We all know that 3G/4G network connectivity sucks hard on your phone's battery – even when you're not using it. That's why this module is a cracker of an idea. Rather than have the phone hitting those 4G high-notes all day long, you can use this to set the phone to auto-switch down to 2G, say, when in sleep mode or when you're using Wi-Fi. You can also set it to maintain network connections when downloading files. The bottom


15:17
49%
Download
FRAMEWORK
Xposed Installer
This is the installer for the Xposed framework, which is a requirement for all modules.
Installed (version 2.5.1)
Added on 17/06/13 · Updated on 13/04/14
INSTALLED
Wanam Xposed
This Application let you customize your Samsung Android 4.2+ Stock firmwares, it should work with custom Roms too, but i HIGHLY recommend to use it with a Stock Rom. Note: Check Trust System user and Uncheck Show notifications on SuperSU App
Installed (version 2.9.6)
Added on 12/09/13 · Updated on 14/05/14
NOT INSTALLED
20MP SuperiorAuto
Use 20MP in SuperiorAuto for Xperia Z1 4.3
Added on 21/12/13 · Updated on 12/05/14
3dot menu Mod
Enable 3dot menu button in all application (using a 0 height navbar)
Added on 15/09/13 · Updated on 15/09/13
[KK] GPSNotification - Bring back the GPS Icon

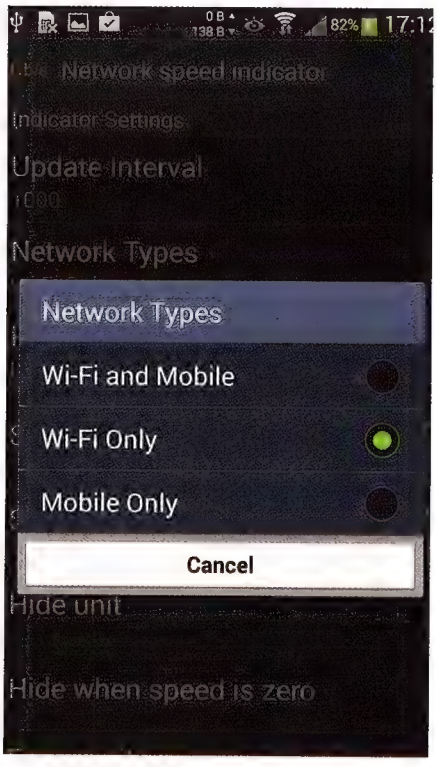
Xposed Framework gives you custom ROM capabilities without the hassle.



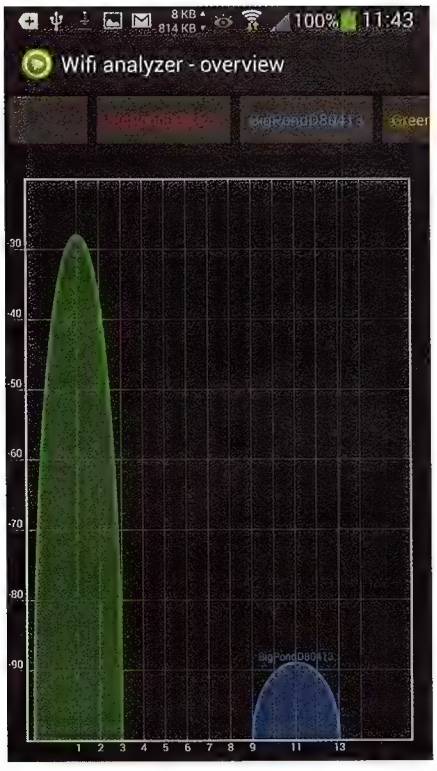
Make sure your device has root access before trying to install Xposed.

Mixing and matching modules

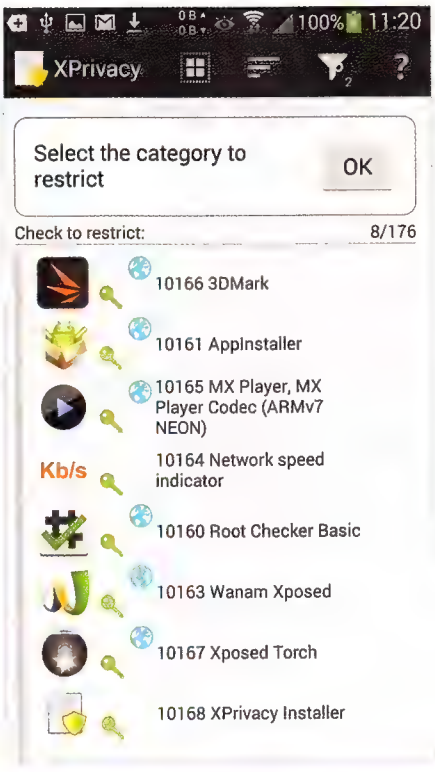
All-in-one tweak module packs like GravityBox and Wanam Xposed/Kit are great, but just beware of running more than one of the same type of module at the same time. If you don't, you may find you have multiple modules fighting over the same features, trying to take control, slowing down your device and sucking up battery life. Our tip — try them one at a time.



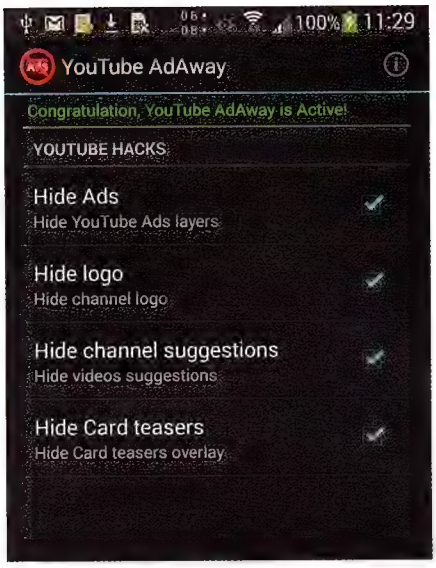
NetworkSpeedIndicator supports monitoring mobile and/or Wi-Fi data transfers.



Combine NetworkSpeedIndicator with WiFi Analyzer to find your fastest download location.



Control what data your apps have access to with XPrivacy.



YouTube AdAway's ability to kill YouTube ads makes it a must-try.

line is that all these tweaks can help improve your phone/tablet's battery life without having to significantly impact your usage pattern. It's definitely a clever way to use the Xposed framework. You'll find this one on Google play as well.

Requirements: Only Nexus 4/5, Galaxy S2/S4 and Note 3 are confirmed working, but should work on Android 4.1+ devices.

Note: Xorware 2G/3G/4G Switcher is an alternative option.

XPrivacy. Despite plenty of protestations, the general prevailing view from internet titans about privacy seems to be 'Privacy? What privacy?' And with countless apps all wanting to share your personal details, location and anything else they can, it's no wonder one of the most popular Xposed modules is XPrivacy. It restricts the type and amount of data an app can have access to – and you can set it on a per-app basis, such as limiting access to your contact list or location, for example. The default option is to automatically prevent app access to any data type as soon as its installed, providing an added layer of data protection. But, it also keeps a log of data access per app so if you still have a problem, the log will tell you which app(s) are the culprit.

You install this one from Google Play – look for XPrivacy Installer. It's a little clumsy, but still well worth a look. Find out more from the GitHub page at **https://github.com/M66B/XPrivacy#features**.

Requirements: You need at least Android 4.0.3/Ice Cream Sandwich and there is a noted issue with the app causing camera lag on the Galaxy Note II.

> "OK, I know. There must be a thousand of these apps on Google Play and I should be made to hold my breath until I count every last blessed one of them!"

YouTube AdAway. We looked at this one last time, but it's so darn useful, it needs to be included again. We don't know about you but we hate those pre-start ads that turn up when you just want to watch your video – even worse when they're 30 seconds long with no skip option. With YouTube AdAway, they're gone. As with other modules, this one doesn't replace your YouTube app – it simply hacks into it using the XposedBridge vector. The only quibble here is that you'll need to update this module each time Google updates the YouTube app, due to code obfuscation by Google's ProGuard feature. YouTube AdAway not only removes the ads, it gets rid of the Channel logo, video suggestions and information card teasers. If you use an Android device to watch YouTube on your media centre setup, this would be a must-have module in our mind.

Requirements: Any Android device with at least Android 4.0.3/Ice Cream Sandwich. You won't find this one on Google Play, so head to **wanamlite.com/youtube-adaway/** or the Xposed Repository at **repo.xposed.info/module/ma.wanam.youtubeadaway**.

GravityBox. If you use a vanilla ROM based on Google's Android Open Source Project (AOSP), GravityBox is for you. It's to AOSP what Wanam Xposed is to Samsung devices, providing a world of user interface customisation tweaks from changing the status bar brightness and colour to one-touch clear-all-recent-tasks, full-screen caller photo and a bucketload more.

GravityBox was originally designed for devices using MediaTek's MTK6589 ARM processor and in that regard, GravityBox actually aims to also fix a few bugs including date/time settings crash and caller ID mismatching. But these days, it claims to support any device running an AOSP ROM.

Requirements: You need an AOSP (or close to it) ROM for Android Jelly Bean starting from 4.1.

Getting to know Raspbian's apps

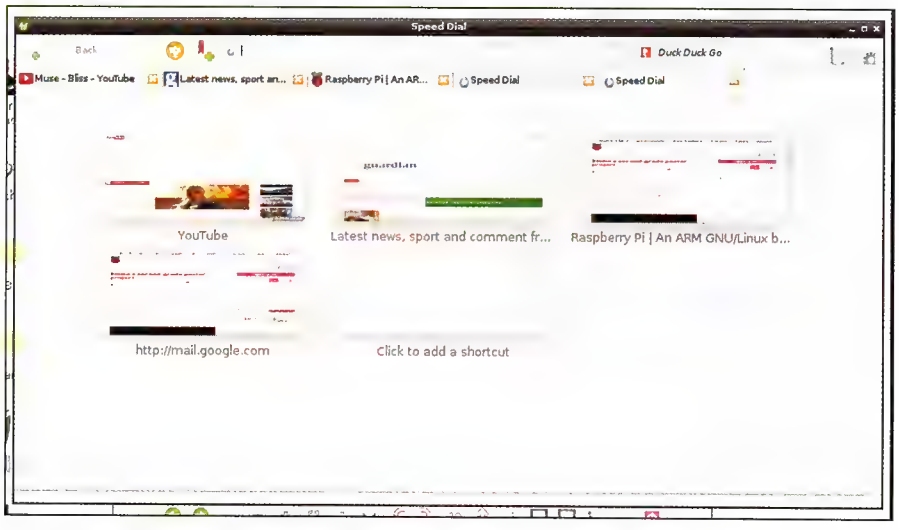
We take a further look inside the Raspberry Pi and find out some of the software that makes this little device so tasty.

BROWSERS

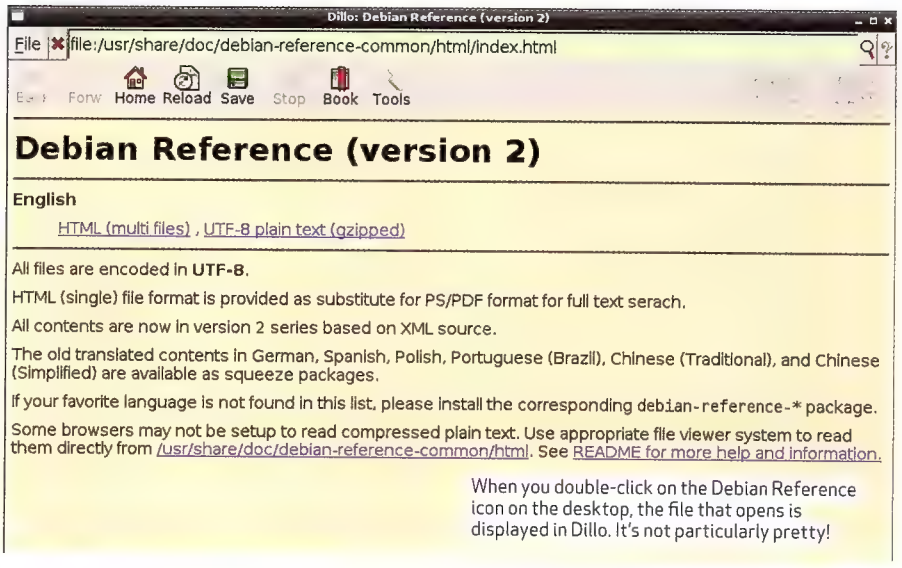
Midori is a lightweight web browser (click on the green icon on the desktop to launch it). By lightweight we mean that, in contrast to Firefox, Internet Explorer or Apple's Safari, it uses very little in the way of system resources, making it perfect for the Raspberry Pi. Despite its small size, though, it has plenty of the features of its bigger competitors.

For starters, it's built on the WebKit browsing engine, so it gives you exactly the same rendering experience as Safari and Google's Chrome browser. It's also smart enough to realise when you enter a search term into the URL bar; rather than simply telling you that you've made a mistake (as Safari does), Midori realises that you want to search for something, and passes it to its default search engine. For once, this isn't Google; it's Duck Duck Go. This finds its results from web sites that are crowdsourced, such as Wikipedia, and as such it gives slightly different results to Google. Sometimes, it's more useful, sometimes it's less useful, but our favourite thing about Duck Duck Go is that it doesn't keep records of your browsing history. It respects your privacy, and that's rare online these days. Give it a go, and if you don't like it, you can always switch to Google or Yahoo by clicking on the Duck icon in the left of the search box.

Another great feature of Midori is its speed dial function. When you press Ctrl-T to open a new tab, you're presented with a small, blank window. Click where it says 'Click To Add Shortcut', enter your commonly-used URL in the box that appears (**mail.google.com**, for example, or **twitter.com**), and the next time you go to open a new tab, you'll see the web site ready to load with just one click. It's a neat feature that was first found in another Linux browser, Opera, and has since been adopted by Firefox and other more commonly used web browsers.



Midori's speed dial feature makes it quicker to reach your favourite web sites.


Dillo: Debian Reference (version 2)
File
file:/usr/share/doc/debian-reference-common/html/index.html
Home
Reload
Save
Stop
Book
Tools
Debian Reference (version 2)
English
HTML (multi files) , UTF-8 plain text (gzipped)
All files are encoded in UTF-8.
HTML (single) file format is provided as substitute for PS/PDF format for full text serach.
All contents are now in version 2 series based on XML source.
The old translated contents in German, Spanish, Polish, Portuguese (Brazil), Chinese (Traditional), and Chinese (Simplified) are available as squeeze packages.
If your favorite language is not found in this list, please install the corresponding debian-reference-* package.
Some browsers may not be setup to read compressed plain text. Use appropriate file viewer system to read them directly from /usr/share/doc/debian-reference-common/html. See README for more help and information.

When you double-click on the Debian Reference icon on the desktop, the file that opens is displayed in Dillo. It's not particularly pretty!

OTHER BROWSERS

Midori isn't the only web browser included in Raspbian (though in our opinion it is the best); you also get one called Dillo. You'll notice when you open it that it looks ancient – that's because its graphical interface is built using a very old toolkit, which was designed back when cavemen rode to work each day on dinosaurs. It's clunky to say the least, and feels like stepping back in time after you've been using Midori.

The advantage of using such old software is that computers from the olden days weren't very powerful, so on modern machinery Dillo loads extremely quickly; even on a Raspberry Pi it feels pretty fast, but the downside is that it doesn't actually work very well. When Dillo was born, JavaScript wasn't nearly as widespread as it is now, and it struggles to handle web sites that use it.

Under the Internet menu entry, you'll also see something called 'Midori Private Browsing'. This is the same application as Midori, but it opens a

window in Private Browsing mode, so no record will be kept of your browsing history.

CODING

As the Raspberry Pi is aimed at the next generation of coders, you'd expect programming applications to be prominently represented in Raspbian's default software selection, and so they are. First, we have IDLE.

IDLE is an integrated development environment (IDE) for the Python programming language. While it's perfectly possible to write code on the command line, an IDE such as IDLE can make the process much more pleasant. It features automatic code completion to save you making tedious typos; syntax highlighting, so different elements of code appear in different colours on-screen; and a built-in debugger to help find mistakes. IDLE won't think for you, but if you've missed the closing bracket off a statement and your code won't run properly, it flags up the mistake before you waste time going through the code line-by-line yourself.

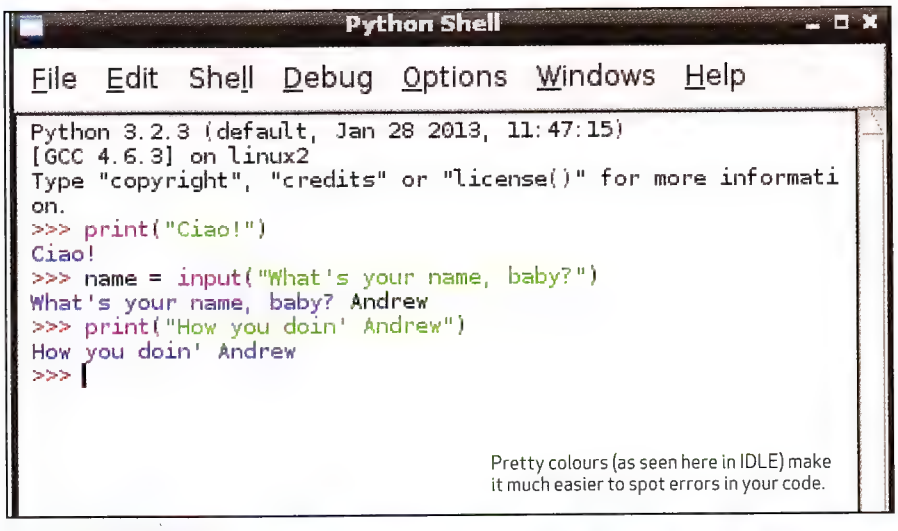
We'll concede that IDLE and IDLE 3 could be better labelled, but really they're the same – all that's different between them is that IDLE 3 is part of Python 3, the latest major version of the Python programming language, and IDLE is included with version 2. As Raspbian includes both versions of Python, both are represented on the Raspbian desktop. Unless you have any need to try out the newest features of Python, we'd recommend using IDLE and Python 2, because this is what Raspbian uses by default.

SCRATCH

Scratch is a programming environment similar to IDE, but instead of typing out the code on a keyboard, you drag lines of code in from a list on the left to a programming area in the middle of the screen. The object is to give an animated cat instructions.

Describing it, we'd have to admit that it sounds rather silly, but as soon as you give it a go, you'll see how intuitive it is, and how good it is at introducing the programming concepts to kids or any other new coders.

You'll never use Scratch in a professional setting, but loops, lists and conditional statements are the bread and butter of solving problems with programming, no matter what language you're using. As such, Scratch is the perfect embodiment of the Raspberry Pi ethos. Teach your kids to play with Scratch and you're guaranteed a comfortable retirement! There is another programming language installed on the Raspberry Pi – Squeak – but we recommend sticking with Scratch and Python.


Python Shell
File Edit Shell Debug Options Windows Help
Python 3.2.3 (default, Jan 28 2013, 11:47:15)
[GCC 4.6.3] on linux2
Type "copyright", "credits" or "license()" for more informati
on.
>>> print("Ciao!")
Ciao!
>>> name = input("What's your name, baby?")
What's your name, baby? Andrew
>>> print("How you doin' Andrew")
How you doin' Andrew
>>>

Pretty colours (as seen here in IDLE) make it much easier to spot errors in your code.

Scratch provides a graphical way to introduce the key concepts of programming.

Why Python?

There are many programming languages, but the Raspberry Pi creators, and the compilers of Raspbian, have used Python as the basis of their tutorials. This is for three good reasons.

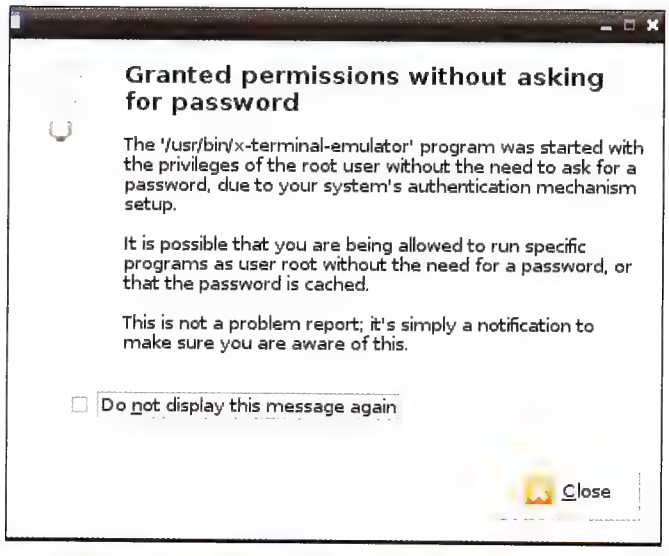
1. Python is easy to read. Once you've had a line of Python code explained to you, it makes sense. The command print("Hello World"), for example, prints the words Hello World to the screen. That's a very simple example, but it illustrates that Python is very human-readable, and easier to understand than other languages.
2. It's interpreted rather than compiled. With a compiled language, such as C or C++, the code must be written, then turned into zeroes and ones using a separate program called a compiler, and only then can it be run — so it's only then that you find out if you've made a mistake. Python is interpreted, so it runs directly from the Python interpreter.
3. Python is cross-platform. What this means in practice is that Python, and the Python interpreter, is available for Linux, Mac OS X and Windows, so once your learning has taken off, you'll be able to practise on any machine.

TERMINAL

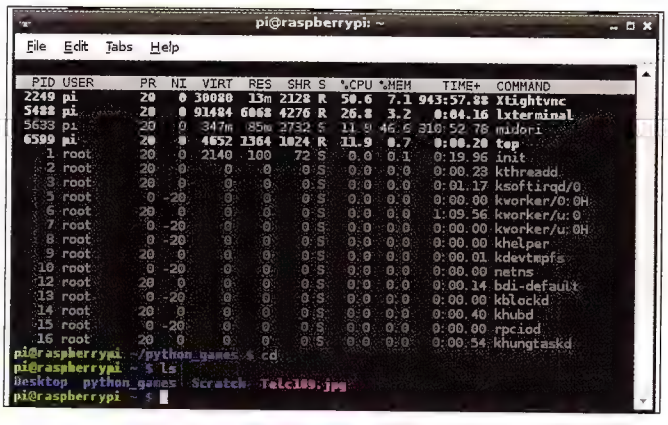
The command line gives you a lot of control over how your computer works. You can always get to the command line by pressing Ctrl-Alt and F1 through to F6 (press Ctrl-Alt-F7 to get back to the graphical desktop), but if you want to stay in the graphical environment – perhaps because you're copying commands from a web site – you can use the Terminal application from the desktop to get a command line.

Also, in the accessories menu, you'll see something labelled Root Terminal. Like Midori Private Browsing, this opens the same application as the normal terminal, but logged in as root.

As the root user, you have privileges over the whole system, not just the user's files, which means a slip on the keyboard could cause big problems, so we can't recommend using the terminal in this mode.


Granted permissions without asking for password
The '/usr/bin/x-terminal-emulator' program was started with the privileges of the root user without the need to ask for a password, due to your system's authentication mechanism setup.
It is possible that you are being allowed to run specific programs as user root without the need for a password, or that the password is cached.
This is not a problem report; it's simply a notification to make sure you are aware of this.
Do not display this message again
Close

Be careful when you're logged in as root. Better still, just don't do it unless you absolutely have to.


pi@raspberrypi: ~
File Edit Tabs Help
PID USER PR NI VIRT RES SHR S %CPU %MEM TIME+ COMMAND
2249 pi 20 0 30080 13m 2128 R 50.6 7.1 943:57.88 Xtightvnc
5488 pi 20 0 91484 6068 4276 R 26.8 3.2 0:04.16 lxterminal
5633 pi 20 0 347m 85m 2732 S 11.9 46.6 316:52.78 midori
6589 pi 20 0 4652 1364 1024 R 11.9 0.7 0:00.20 top
1 root 20 0 2140 100 72 S 0.0 0.1 0:19.96 init
2 root 20 0 0 0 0 S 0.0 0.0 0:00.23 kthreadd
3 root 20 0 0 0 0 S 0.0 0.0 0:01.17 ksoftirqd/0
5 root 0 -20 0 0 0 S 0.0 0.0 0:00.00 kworker/0:0H
6 root 20 0 0 0 0 S 0.0 0.0 1:09.56 kworker/u:0
7 root 0 -20 0 0 0 S 0.0 0.0 0:00.00 kworker/u:0H
8 root 0 -20 0 0 0 S 0.0 0.0 0:00.00 khelper
9 root 20 0 0 0 0 S 0.0 0.0 0:00.01 kdevtmpfs
10 root 0 -20 0 0 0 S 0.0 0.0 0:00.00 netns
12 root 20 0 0 0 0 S 0.0 0.0 0:00.14 bdi-default
13 root 0 -20 0 0 0 S 0.0 0.0 0:00.00 kblockd
14 root 20 0 0 0 0 S 0.0 0.0 0:00.40 khubd
15 root 0 -20 0 0 0 S 0.0 0.0 0:00.00 rpciod
16 root 20 0 0 0 0 S 0.0 0.0 0:00.54 khungtaskd
pi@raspberrypi ~/python_games $ cd
pi@raspberrypi ~ $ ls
Desktop python_games Scratch Telc109.jpg
pi@raspberrypi ~ $

The terminal gives you a convenient way to look beneath the graphical interface to see what's going on below.

ACCESSORIES

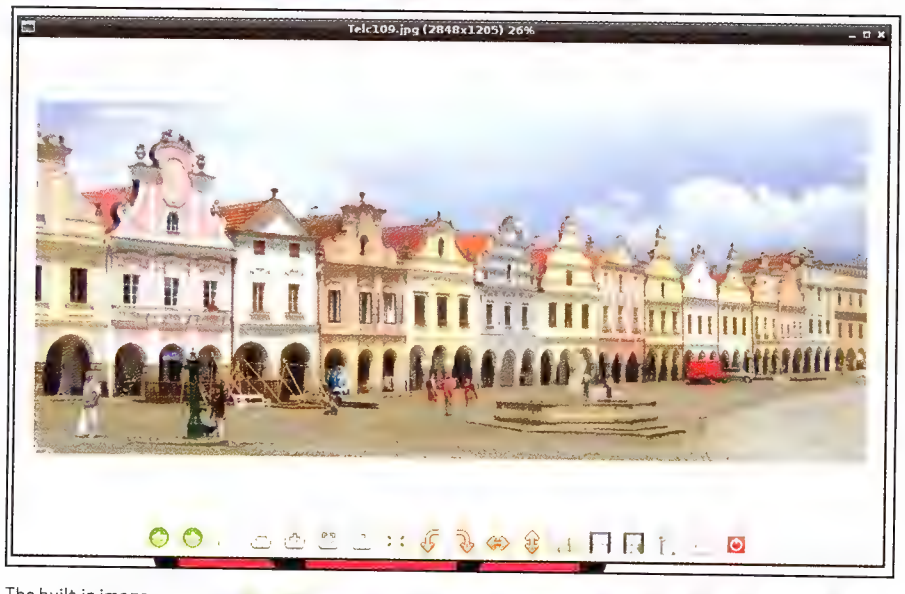
Big word processors, such as Microsoft Word and LibreOffice, are enormous pieces of software, and if you tried to run them on a Raspberry Pi, with its humble 700MHz processor, it would struggle (in contrast, the bottom-of-the-range Apple iMac has a 2.7GHz processor, which is almost four times faster).

Instead of a word processor, Raspbian gives you Leafpad. This is a very basic text editor, which eschews formatting, image embedding and all the other bloat that we've become used to over the years and instead focuses on giving you a window, into which you can type words. That's it.

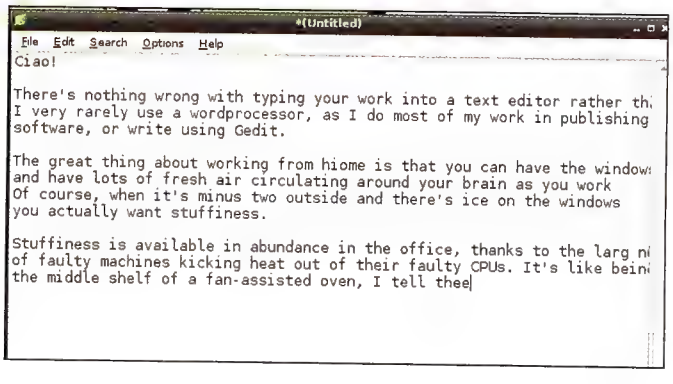
If you double-click on an image file, you can open it at full size in the file manager, but if you take the time to use Image Viewer, you'll find it much more useful. It can rotate and flip images, and zoom in and out, so it's better for browsing a collection of images than the basic file browser.

Again, it doesn't have all the bells and whistles of Adobe Photoshop or any of its free-software equivalents, but it does what it does adequately, and it works well on the most basic of hardware.

Finally, there's Xarchiver. If you're creating large numbers of files on the Raspberry Pi, you're going to run out of space pretty quickly. The answer to this is to either buy an SD card with a greater storage capacity, or to bundle your files up with Xarchiver and save them somewhere else – another machine you own, or a cloud hosting provider.



The built-in image viewer — cunningly called Image Viewer!

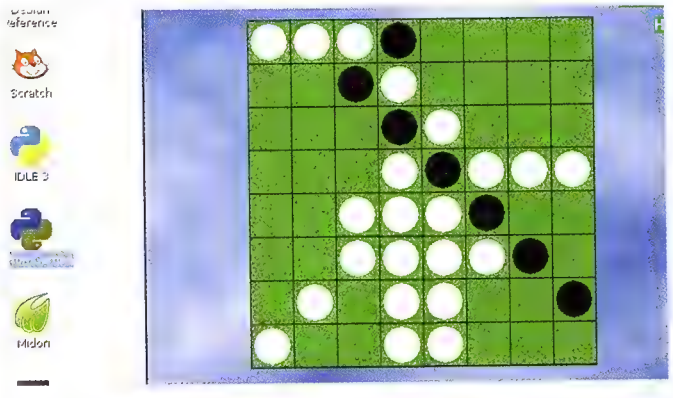

*(Untitled)
File Edit Search Options Help
Ciao!
There's nothing wrong with typing your work into a text editor rather th
I very rarely use a wordprocessor, as I do most of my work in publishing
software, or write using Gedit.
The great thing about working from hiome is that you can have the window
and have lots of fresh air circulating around your brain as you work
Of course, when it's minus two outside and there's ice on the windows
you actually want stuffiness.
Stuffiness is available in abundance in the office, thanks to the larg ni
of faulty machines kicking heat out of their faulty CPUs. It's like beini
the middle shelf of a fan-assisted oven, I tell thee

Type words and create documents (albeit basic ones) with Leafpad.

PYTHON GAMES

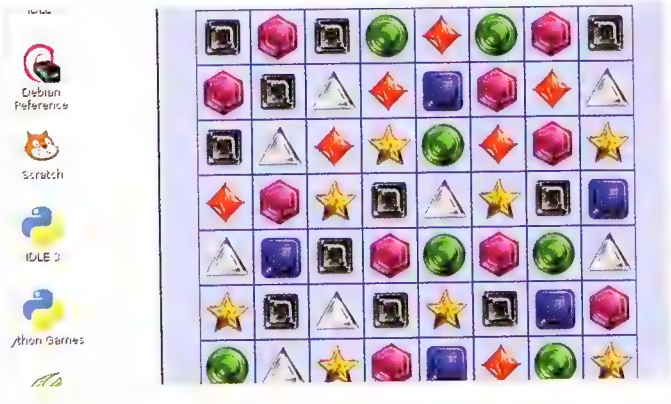
Raspbian comes complete with a small, but perfectly formed, selection of games. We've heard reports of people getting it to run Quake III, but the games included by default are altogether simpler puzzle games aimed at kids. Double-clicking on the 'Python Games' icon on the desktop will bring up a menu of 10 games, which are all clones of well-known puzzlers that have been around for years, or else are implementations of classic children's games (such as Connect Four, which is cloned here in the shape of *Four In A Row*).

What's more, all the games are open source, so you're perfectly free to poke around in the source code – perhaps using the IDLE development environment – and change things to see what happens. Also included is *Starpusher* – a clone of the classic Japanese game Sokoban, an addictive little puzzle game. It's simple, but extremely infuriating and rewarding in equal measure. Then there's the baffling *Squirrel Eat Squirrel*, and, as seen on a thousand mobile phones, *Wormy*. This *Snake* clone is still one of the best ways to waste a bus journey when you could be reading some improving literature instead.



FLIPPY

Othello (also known, for copyright reasons, as *Reversi*) is reproduced in the Raspberry Pi as *Flippy*. Place your counters on the board to capture your opponent's counters.

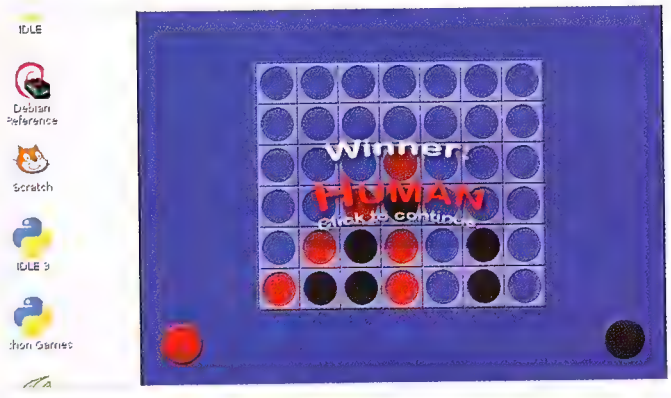


GEMGEM

Clone of the maddeningly addictive *Bejewelled*, in which the player swaps adjacent jewels to create matching rows and columns. The more you match, the more points you score.

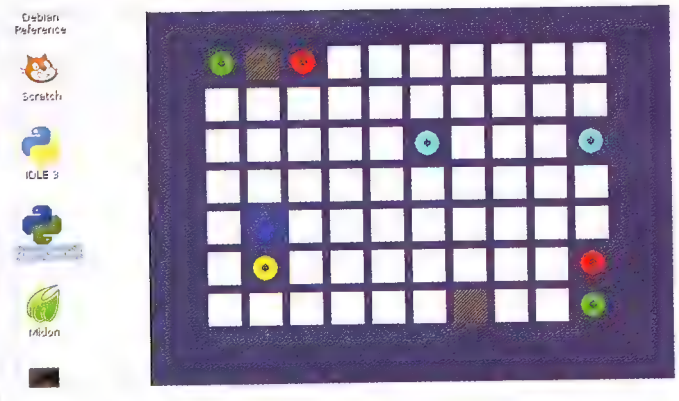
SIMULATE

The squares on the screen will move in time; all you have to do is remember the sequence and then repeat it by clicking on the squares in the right order.



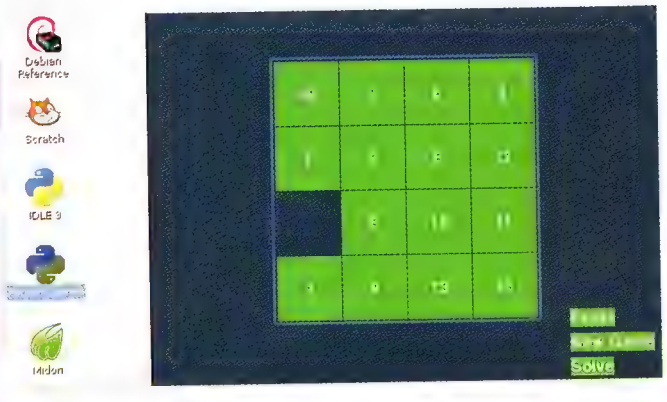
FOUR IN A ROW

Drop counters into the grid to make four in a row. We know it's aimed at kids, but it's still immensely satisfying to beat the computer at this one.



MEMORY PUZZLE

Uncover the different icons, trying to match pairs and remembering what went where. Extremely frustrating for the colour-blind; slightly less frustrating for everyone else.



SLIDE PUZZLE

Move the tiles around to create the numerical sequence. This is ugly, but it's ripe for modification with your own images, once you learn a bit of Python programming.

Geb, the Egyptian god of earth, likes to rock and roll.

Arena mode: what happens when Zeus starts a bar fight.

FREE TO PLAY WITH IAP | PC | WWW.HIREZSTUDIOS.COM/SMITE

Smite

A generous and accessible alternative to the bigger lane-pushers.

apc HOT PRODUCT

They have no idea I'm here," says teammate, Lucas Sullivan as he sneaks up behind two enemy gods in my lane. I'm casually killing minions in front of my tower in Conquest mode, *Smite's* take on the 5v5 lane-based game codified by *Dota* and *League of Legends (LoL)*. On a strategic level, it plays almost identically to *LoL*, but it tucks the camera in close behind your character's back, and feels more like a third-person action game.

"They have no idea I'm here," Lucas repeats, giddy, as he moves into attack range behind our targets. He kills one with a flurry of special abilities, and is on top of the next before I can even help. Two free kills. They didn't see him because they never turned around. And if you never turn around in *Smite*, you're probably going to die.

By taking away the genre's standard top-down camera, *Smite* transforms the wizard-'em-up into a game of close-range kills, dodges and precision skillshots. In an overcrowded market, the game distinguishes itself not with what it adds to the formula, but with what it strips away.

Judging distance in three dimensions is far harder in *Smite* than it is with a top-down camera. In *LoL*, many champions can land basic attacks and devastating abilities with a simple click. They can't miss. In *Smite* almost everything can miss. In a match I played as Vulcan (the Roman fire god, not Dr Spock), I had Egyptian goddess Neith dead to rights. She was down to a sliver of health when I launched my Ultimate ability, a rocket that creates an AoE circle as wide as a lane. There was no way she could flee in time. But at the last second, she used Back Flip — not to jump out of the circle, but to be in the air as the missiles landed. She got away.

Each attack that you manage to land, whether it's Egyptian god Anhur's javelins or Poseidon's blasts of water, feels like a minor victory. Each attack that you anticipate and dodge feels like a major accomplishment.

DEITY BUSINESS

Smite's combat is so much fun that I ended up spending more time playing its action-focused Arena mode than Conquest. Arena is essentially team deathmatch with accelerated levelling. Each kill peels points away from the enemy team's score, and the whole thing is over inside 20 minutes. It's a great way to test out a new god.

Despite its demand for precision, *Smite* is more approachable than either *LoL* or *Dota 2*. Battles are frantic, but most gods have generous escape abilities that enable them to leap out of combat or chase a fleeing foe.

Experience and gold are shared within a short range, so getting the last hit on a minion to kill it isn't a critical part of the laning phase. The meta levelling progression, however, is missing something. Levelling an account to 30 simply grants players access to ranked league matches, with no extra unlocks or rewards along the way.

A robust voice-command system adapted from *Tribes: Ascend* simplifies callouts such as 'missing in action', 'retreat' and so on. It makes teamwork with strangers very effective. *Smite* has one of the least vitriolic competitive communities I've played with.

The free-to-play economy is also refreshingly streamlined. You can't spend money on anything that affects the game's balance. Real money and in-game currency are only used to buy new gods, skins and voice packs.

Perhaps my strongest endorsement is that whereas in *League of Legends* I spent a great deal of time mastering one champion that I loved, in *Smite* I'm finding something to like in almost every god I play. I don't think that I've truly mastered any of them yet, but I have, at least, learned to watch my back. ■ **Wes Fenlon**

Verdict

Makes the lane-pushing genre more approachable with smart tweaks to the formula and action-RPG combat.

★★★★½

$49.95 | PC | WWW.TROPICO5.COM

Tropico 5

Further refining the city-building series, but fails to meaningfully advance it.

Frankly, I am not the man you want running your country.

Over the course of my extended presidency I've smuggled rum into a prohibition America, sided with Axis powers during both World Wars, systematically stripped away the rights of my citizens, and assassinated a grandma for opposing my regime. I'm not proud of these things, but I'm glad I felt the need to do them. For all that *Tropico 5* adds to the city-building series – and all the ways it doesn't advance the formula enough – its greatest success is in pushing you towards the murkier aspects of dictatorial rule.

Rather than inhabiting the genre's favoured role as the floating god-mayor of urban planning, in *Tropico 5* you play a banana republic's ruling dynasty. You still use a top-down view to place buildings and trade goods, but must also navigate the island's politics – surviving both the international machinations of world superpowers, and your populace's desire for democracy and happiness.

Where Haemimont's previous two *Tropico* games took place around the Cold War, this time the action spans multiple eras. It changes the pace and shape of a sandbox campaign, offering a longer period of island management that encourages a broader range of industry and development. More importantly, it restricts your early-game options, making it harder to stay in power.

After declaring independence from the crown in the colonial era, my people asked for elections. Foolishly I agreed, having been conditioned by previous games to expect an easy win. Only, without access to the advanced industry that would normally bulk up my war chest, I wasn't able to effectively address the needs of the populace. Instead of securing power through the creation of a paradise, I did it via the more realistic tools of heavy intimidation and lots of electoral fraud.

Optional missions help to add a dynamic element to the sandbox mode, by requesting specific buildings or criteria. But their limitations are clear, as instead of reacting to the specific choices you've made, they're pulled – seemingly at random – from a pool of possibilities. I was offered objectives I'd already fulfilled, and instantly rewarded upon accepting them. Better implemented are the requests that come from agreeing to negotiate with protesters, which are, at least, offered in direct response to your island's failings.

There's a persistent element to proceedings, your dynasty expanding across every game, be it sandbox, multiplayer or campaign scenario. You can switch between family members each election, and they all offer a different global bonus. These bonuses can be upgraded with embezzled funds, so when a faction offers you a choice between extra trade routes, more finance or your own slush fund, it feels like a more meaningful decision.

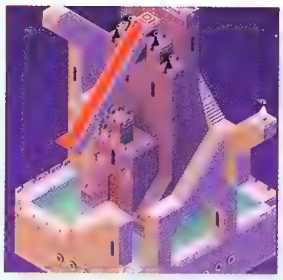
For all its improvements, *Tropico 5* is still iterating on the template set by its predecessors. In many ways, that's a good thing: it's a formula that, behind the overt political caricatures, is deceptively clever – but *Tropico 5* fails to move the series forward. If you're new to *Tropico*, don't be put off: this is the version deserving of your vote. But as a returning ruler, I was hoping for more of a revolution.

Phil Savage

Verdict

Not a dramatic reinvention, but still an enjoyable game of construction, economics and election fraud.

★★★★☆



Monument Valley

A sweet, enticing puzzler that even Escher would scratch his head at.

$4.99 | IOS/ANDROID
WWW.MONUMENTVALLEYGAME.COM

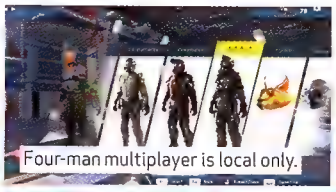
This contemplative, quiet trek through illusion-soaked puzzle lands is all about altering the perspective — moving your view or tweaking a dial to make two disconnected parts of the levels meet, letting your character walk to the exit. Change one small thing and a bridge might fall into place, or a barrier is removed. Inspiration is no doubt pulled from the surreal artwork of MC Escher.

What makes *Monument Valley* really magical is its sensational presentation. It's a compact experience — less than two hours in total, unless you dawdle around a bit (which would be understandable, considering the sights) — but we kept taking screenshot after screenshot from start to finish, as each locale proved more magnificent than the last. The settings are cleanly, precisely drawn, punched up with a vivid colour palette, and made divine with rich animations. Add in the haunting soundtrack and the adventure builds incredible atmosphere inside a short span of time.

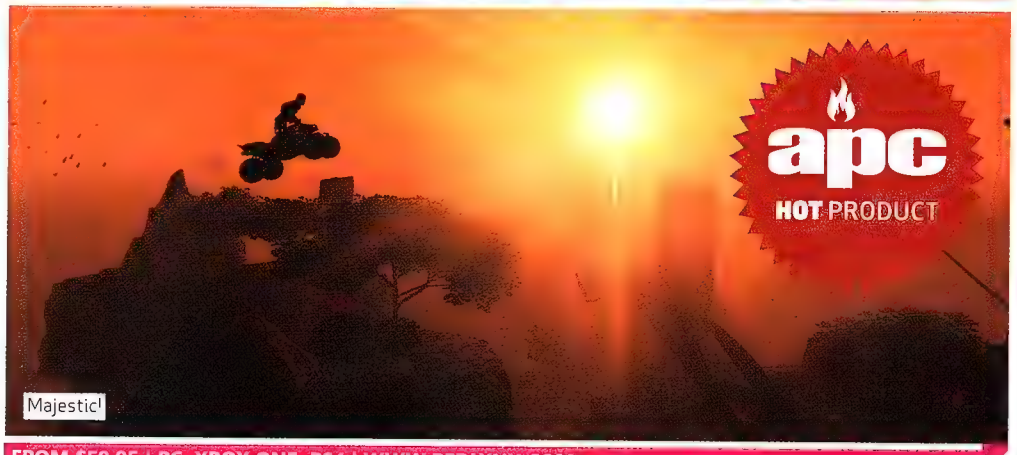
Occasional hints of story serve as a nice hook to pull you through to the dazzling later areas (and a nice conclusion), though we wish the puzzles required a little more contemplation as the game progressed — or at least that there was a bit more of the game and its terrain. There's no question of worth, however: *Monument Valley* is surely one of the most beautiful games we've ever played.

■ Andrew Hayward

Each track has three bespoke challenges.


Four-man multiplayer is local only.

The lighting is insane.



Majestic!

FROM $59.95 | PC, XBOX ONE, PS4 | WWW.REDLYNX.COM

Trials Fusion

Going head over handlebars for a bike-based physics lesson.

***Trials Fusion* has one of the most brutally honest trailers ever. Ignore the early dubstep-fuelled montages of rad dudes doing cool stuff; that's only part of the game. Mostly, you'll be biting it. Hard.**

The trailer presents an ignoble reel of spills. After each one, the player's name plummets down a leaderboard. It captures the spirit of a game devious enough to continuously knock you on your backside, but compelling enough to keep you rising to your feet.

It's about friction, momentum and gravity. To jump, you must distribute your weight accordingly, rock back, then snap forwards with purpose. The controls are basic but versatile, and you'll find your own methods of movement between the buttons rather than through them. That's the reason those noisy montages of rad dudes doing cool stuff are better to watch than play — because essentially all they're doing is holding Accelerate and letting the course do the work. It's fun, but hardly challenging. *Trials Fusion* comes into its own when you're making slow progress.

TRICKS AND TRACKS

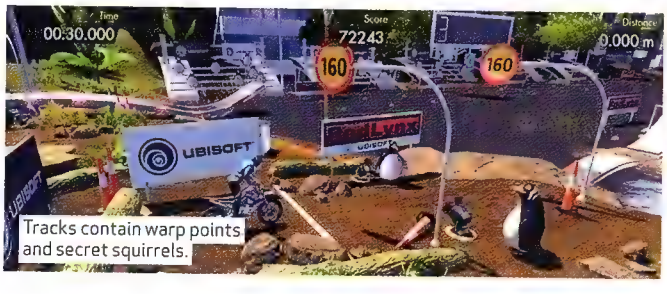
Fusion, like its predecessors, almost qualifies as two different games. While the punishing second half deals in piecemeal progress, the first is all about big air, monster tricks and constant forward motion.

The philosophy is the same as before, but on an unprecedented scale. There are urban sprawls where shiny spaceships dock and cars whizz down roads. It's impressive, but distracting.

Tricks are new. They don't net you points, unless we're talking about the FMX mode where only top stunts assure a good finish. If anything they're more like a great temptation, making the fight not only between you and the course, but also your ego. You could do the job quickly, or you could do it right.

If it wasn't clear from the booming electronic menu music with its "Welcome to the future!" chorus, collection of detailed tracks, and a primed and ready-to-go method of letting players create and share tracks, *Trials Fusion* is a big game. It's a bona fide platform. However, while that's great, that isn't the best part. No, the best part, like in a touching sports movie, is in the tumbles and spills. The small motions rather than the massive gestures.

■ Ben Griffin



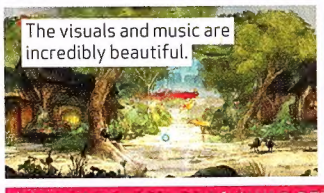
Tracks contain warp points and secret squirrels.

Verdict

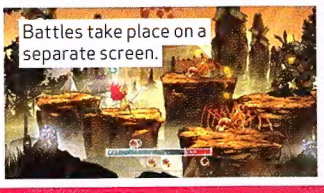
The thrill is not found in leaping a chasm, but in the simple clearing of an overhanging ledge with efficient grace.

★★★★½

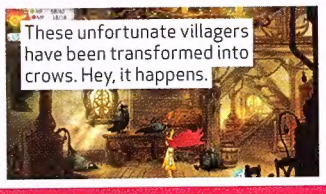
This early boss forces you to make use of elemental magic.



The visuals and music are incredibly beautiful.



Battles take place on a separate screen.



These unfortunate villagers have been transformed into crows. Hey, it happens.

$29.95 | PC, PS3, PS4 | CHILDOFLIGHT.UBI.COM

Child of Light

An elegant but disappointingly shallow turn-based RPG.

***Child of Light* is an RPG in the Japanese mould, incorporating elemental turn-based combat and party management, but it's the painterly art style that catches your eye first.**

This is a vivid watercolour world that looks like an animated children's storybook, with shimmering water and soft lighting helping to bring the 2D backgrounds to life. Aurora's red hair billows in the wind as she runs, and enemies lurch towards her with a fearsome gait. Artistically, it's hard to fault *Child of Light* at all.

You explore this world in the conventional manner of a side-scrolling game. Conventional, that is, aside from the fact that early on Aurora is granted a pair of wings that let her flutter freely around the large, detailed environments. The flying feels light and responsive, but you must avoid thorny branches, gusts of wind, and traps.

Levelling is fairly rapid. This is a 12-hour game, not a grand, sweeping *Final Fantasy* epic. Each level grants you a point that you can invest in a skill tree, but the rewards could be more compelling. You're not unlocking reams of new spells and abilities, just small bonuses to your magic points, critical hit chance, dodge chance and so on. There's no sense that you're creating your own unique version of Aurora, which weakens the roleplaying aspect of the game.

Aurora is accompanied by Igniculus, a firefly who floats around her activating switches, opening chests and collecting wishes: glowing orbs that restore health and magic points. You can control him yourself, or another player can take over. Moving and interacting is simple enough that a young child or someone who doesn't normally play videogames could comfortably join in, but we suspect that most kids will quickly get bored because there isn't that much to do. Aurora has all the fun.

PAINTING BY NUMBERS

While simplistic, the battles do have a little depth. The strategy lies in knowing when to attack, when to defend, and when to hang back and heal. A bar shows you when an enemy is about to attack in relation to your next action, which lets you plan your moves. Igniculus can be used to blind an enemy and slow them down, giving you a few precious seconds to buff and heal your party or preemptively block.

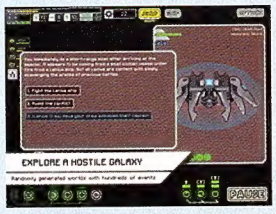
I was never invested in the twee, saccharine story, and found the land of Lemuria itself more captivating than anything that was happening there. The problem with this kind of lightweight fairytale fantasy is that it's painted in such broad strokes that it doesn't offer much scope for interesting characters – which are something any good RPG needs to be engaging.

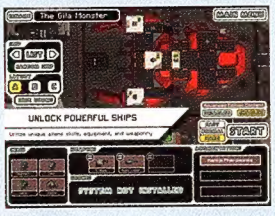
It's certainly elegant and polished, but neither rich nor customisable enough to provide a satisfying roleplaying experience. There's fun to be had here, and it has a lot of heart, but I didn't love it as much as I thought I would. ■ **Andy Kelly**

Verdict

A beautiful game to look at, polished and a welcome break from the norm, but it's a thimble-deep RPG.

★★★☆☆





FTL: Faster than light

She's got it where it counts

$12.99 | IOS

WWW.FTLGAME.COM/

Life at the helm of a rickety space cruiser is never dull. *FTL's* galaxy-hopping adventure throws you into a series of encounters that change every time you play as you battle to carry important plans to your commanders. Between managing your ship's systems and conducting your crew in combat, there's a lot of pulse-pounding fun on tap.

Diplomacy and the odd shady deal sometimes let you persevere without risking your ship, but the promise of a good battle is never that far off on the horizon. *FTL's* real-time combat encounters have you juggling various offensive options, all while simultaneously sending crew members scrambling to repair damage to your own craft. It's sometimes a lot to take in at once, but the ability to pause and strategise pairs well with comfortable touch controls. *FTL* is massively good fun, and though you'll die a lot, it rarely frustrates.

■ **Nathan Meunier**

Almost not the first billionaire in hip-hop

With friends like these, who needs enemies?

At time of writing it's just been announced that the long-rumoured Apple acquisition of music business Beats Music and Beats Electronics is coming to pass, with Apple snapping up the music streaming/hardware company for a tidy US$3 billion. But according to reports from sources close to negotiation, the deal almost didn't go through. One of the more embarrassing reasons threatening the transaction was Apple's supposed outrage over a celebratory video posted online before the deal was formally confirmed. The controversial video, shot by actor and musician Tyrese Gibson (most famous for his work in the *Fast & Furious* films), depicts Dr Dre, rapper and co-founder of the Beats business, partying and drunkenly boasting that he is "the first billionaire in hip-hop, right here from the mother-f!@$% west coast, believe it!" Gibson deleted the video after he had shared it on his Facebook page, but not before enterprising individuals ripped a copy of the shenanigans and uploaded it onto YouTube, promptly sending the PR faux pas viral.

OVER THE MOON

While LTE mobile networks slowly increase their staggered rollout across the globe, some companies are looking at alternative means of providing mass-scale wireless internet connectivity: Wi-Fi. In the US Google has long experimented with providing free blanket-coverage Wi-Fi over large urban areas, while closer to home Telstra recently announced an intriguing (and controversial) plan to let its broadband users share their home Wi-Fi connections with any other Telstra users in range, in exchange for free reciprocal access to others' connections. While covering a CBD or city with blanket Wi-Fi coverage is a fine thing, NASA's been working on an even more ambitious plan: effectively broadcasting Wi-Fi to the Moon. New laser-based communication uplink technologies devised by NASA and the Massachusetts Institute of Technology are said to be capable of beaming a data connection to the moon — nearly 400,000km away — at 19.44 megabits per second, some 4,800 times faster than the radio frequency uplinks previously used.

WEEDING OUT THE IT TALENT

The latest federal budget might be poised to axe many jobs in the Australian public sector, but in the US it seems they're actually expanding some governmental agencies — but not without difficulties, mind you. The FBI, charged with recruiting an additional 2,000 workers this year, is finding it hard to attract the right recruits — particularly to its cyber-crime division, it seems — due to young programmers' and hackers' penchant for marijuana. The FBI, which enforces a strict non-hiring policy for any candidates who have smoked pot in the past three years, has admitted it might need to relax its prohibitive stance in order to recruit the best coding talent, with Director James B. Comey saying the organisation is "grappling with the question right now". According to Comey: "I have to hire a great work force to compete with cyber criminals and some of those kids want to smoke weed on the way to the interview."

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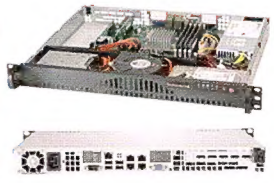
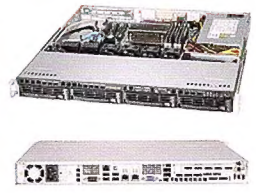
2x FIXED Drive Bays
IPMI 2.0 with KVM over LAN



- Intel® Atom™ Processor C2550
- Up to 64GB DDR3 1600MHz ECC/non-ECC UDIMMs in 4 slots
- 2x 3.5" Fixed SATA3 HDD Bays OR 4x 2.5" SATA2 (optional)
- 1x PCI-E 2.0 x8, 1x PCI-E 2.0 x4 Expansions Slots
- Quad GbE ports, IPMI w/ dedicated LAN
- 200W Low Noise AC-DC Power Supply with PFC

DreamMicro Power Server 1U
5018D-MTF From $1,249 RRP

Intel Xeon 4th Generation
4x HOT SWAP Drive Bays
IPMI 2.0 with KVM over LAN



- 1x Intel® Xeon® E3-1200 v3 4th Generation Processor
- Up to 32GB DDR3 ECC 1600MHz UDIMMs in 4 slots
- 4x 3.5" Hot-swap SATA3 HDD Bays
- 1x PCI-E 3.0 x8 (in x16) Full-height Expansion Slot
- Dual Gigabit LAN (1x Intel® i217LM & 1x Intel® i210AT)
- 350W Gold Level Power Supply

DreamMicro Power Server 1U
S100-L11L From $1,499 RRP

Intel Xeon 4th Generation
12x FIXED Drive Bays
IPMI 2.0 with KVM over LAN

- 1x Intel® Xeon® E3-1200 v3 4th Generation Processor
- 4x DDR3L 1333/1600MHz ECC UDIMM slots
- 12x 3.5" or 2.5" SATA fixed HDD/SSD bays
- 1x PCIe G3 x8 slot (x 8 signals) Slot
- 1x Intel® 82599ES 10Gb SFP+; 4x Intel® 82574L GbE RJ45
- 1x fixed 80plus gold-level 400W Power Supply

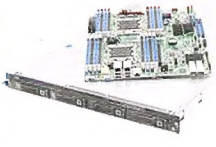
DreamMicro Power Server 1U
S100-X1S1N From $1,149 RRP

Intel Xeon 4th Generation
4x HOT SWAP Drive Bays
IPMI 2.0 with KVM over LAN

- 1x Intel® Xeon® E3-1200 v3 4th Generation Processor
- 4x DDR3L 1333/1600MHz ECC UDIMM slots
- 4x 3.5" or 2.5" hot-plug HDD/SSD bays + 2x fixed 2.5" bays
- 2x PCIe G3 x8 mezzanine slots (x 8 signals)
- 2x Intel® I210 GbE RJ45 ports
- High efficiency 400W Power Supply 80 Plus Gold

DreamMicro Power Server 1U
S210-X12MS From $1,349 RRP

Intel Xeon E5-2600/v2
4x HOT SWAP Drive Bays
IPMI 2.0 with KVM over LAN



- Intel® Xeon® Processor E5-2600/E5-2600 v2
- 16x DDR3 800/1066/1333/1600/1866MHz RDIMM/LRDIMM
- 10x 2.5" or 4x 3.5" Hot-plug HDDs
- 1x PCIe x16 G3 slot for low-profile card or mezzanine
- 2x Intel® I350 1GbE RJ45 ports
- 650W High efficiency fixed Power Supply

DreamMicro Power Server 2U
5027R-WRF From $2,099 RRP

Intel Xeon E5-2600/1600
8x HOT SWAP Drive Bays
IPMI 2.0 with KVM over LAN

- 1x Intel® Xeon® Processor E5-2600/E5-2600/1600 v2
- Up to 512GB ECC DDR3, Up to 1866MHz; 8x DIMM slots
- 8x 3.5" Hot-swap HDD bays
- 4x Full-height x8 & 1x Low-profile x8 slots
- Integrated IPMI 2.0 and KVM with Dedicated LAN
- 500W Redundant Power Supplies Platinum Level (94%+)

DreamMicro Power Server 2U
6027R-WRF From $2,399 RRP

Intel Xeon E5-2600/v2
8x HOT SWAP Drive Bays
IPMI 2.0 with KVM over LAN

- 2x Intel® Xeon® Processor E5-2600/E5-2600 v2
- Up to 1TB ECC DDR3, Up to 1866MHz; 16x DIMM slots
- 8x Hot-swap 3.5" SAS/SATA HDD bays
- 4x PCI-E 3.0 x8 (2 full and two half length) slots
- Intel® i350 Dual port Gigabit Ethernet Controller
- 740W Redundant Power Supplies Platinum Level (94%+)

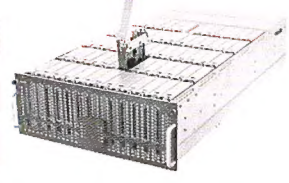
DreamMicro Power Server 2U
S210-X22RQ From $1,899 RRP

Intel Xeon E5-2600/v2
12x HOT SWAP Drive Bays
IPMI 2.0 with KVM over LAN

- 2x Intel® Xeon® processor E5-2600/E5-2600 v2
- 24x DDR3 800/1066/1333/1600/1866MHz RDIMM/LRDIMM
- 24x 2.5" or 12x 3.5" Hot-plug HDDs
- 4x PCIe x8 G3, 1x PCIe x4 G3 low-profile + more
- 2x Intel® I350 GbE RJ45 OR Intel® X540 10GbE Base-T RJ45
- 1100W High efficiency redundant Power Supply

DreamMicro Storage System 4U
M4600H From $6,799 RRP

Enterprise storage system
60x HOT SWAP Drive Bays
Scalable up to 120 HDDs



- Ultra-dense, scalable, cost-effective disk expansion unit
- Supports 60 Hot-swappable 3.5"/2.5", SAS/SATA
- Scalable up to (120) HDDs in cascading
- 2x SAS (SIM) + 4x SAS (ISIM) Interface Modules
- 1x Mini USB management port
- 2x 1400W High efficiency redundant Power Supplies

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